RAILROAD GAZETTE

FRIDAY, FEB. 3, 1893.

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Contributions.

Train Accident Record—Correction.

The accident record for December, printed in the *Railroad Gazette* of Jan. 20, contained a report of a collision on the Boston & Albany at East Albany, N. Y., on Dec. 15, and one of another on the same road at the same place on the 22d. An engineer was reported injured in the first case, and a brakeman in the other. The Superintendent of the road informs us that the injury to the engineer on the 15th occurred without any accident or damage to the train, and that no one was hurt in the accident of the 22d. This last collision occurred on a crossing of the Boston & Albany and New York Central. The principal damage was the upsetting of two empty freight cars.

Surplus Stores and Stores Not Standard.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with interest the account of a system of transfer accounts for railroad supplies in the *Railroad Gazette* of Jan. 20. The results arrived at must of course have been satisfactory, though the method used seems unnecessarily cumbersome. On nine-tenths of the roads of the country similar care would probably meet with results similar to those referred to in that article. There is one weakness in the organization upon the road quoted, and that is the control of the supplies by the Superintendent of Motive Power. The work can always be done more efficiently where an officer other than the one using the material carries the supply. I remember one notable example in the case of a large eastern system which "set the pace," so to say, for mechanical and engineering standards to a large extent, for the roads of the country. While all the matters relating to the mechanical parts of the shops, structures and equipment were in extremely good order and showed constant care, the state of affairs in the store houses was not good. The assortment seemed poor and not well watched, packages were not neatly kept, various articles gave evidence of having been on hand for a long time, and the general appearance showed want of system and care, and locking up a larger amount of money than there was any need for.

It would be interesting to know the amount of average monthly issues the reduced stock of $650,000 referred to in your article corresponded to. In referring to the matter of ordinary material with respect to the time of delivery, I would say that any road east of the Missouri river can be run on one month's supply of miscellaneous store-house material. It may be that, as in some other researches referred to in your various numbers, the fact that can be shown from the attempt at reducing stock will be, not the excellence of the new method, but the want of system of the old.

It may be interesting to state that the writer has, in his own experience, made a reduction on similar lines of action of more than twice the $350,000 noted in your article.

Herewith are sent sample sheets showing the form of report for surplus and second hand material on a system of some 7,000 miles. The scope of this report is wider than that referred to in your article, as it covers all departments. On the system referred to, the average supply carried in all store-houses, not including fuel, rails and ties, is about $900,000. The issues for the last two months amounted to 94 per cent. and 95 per cent. The amount of money represented by the surplus list is only a few thousand dollars, varying from month to month according to season and traffic. The attention to detail that is now being paid in so many directions cannot but prove of great value to the roads. The great need of economical management is often a persistent and systematic watch of details, and the results reached will be most gratifying. X.

[Accompanying this communication is a ten-page hectograph pamphlet containing the list of the surplus and second-hand material, and material not standard, at various points on the system, January 1893. The first page of the pamphlet contains a reference table giving a list of the store-houses on the system, and a reference letter or letters for each store-house. Then comes the following notice:

"Supply agents should carefully scrutinize all requisitions received by them for material, and in every possible case, use the material shown on the following pages to fill such requisitions, substituting the nearest size that can be found in the surplus list, for the exact size ordered, whenever it is possible to do so. Use old stock and broken packages first. Carry nothing but standards. Keep stock in neat condition. Do not pile new material on top of old supply. Watch this list closely when making requisitions. Report promptly monthly any changes needed. Any second-hand material belonging to any department may be reported on this list, so as to be used elsewhere if possible."

We give a list of the headings for the different classes of material, but omit the quantities, except in a few cases, which serve to illustrate the small amount of material kept on hand. In cases where no material is given under a heading we have marked "No stock."—EDITOR RAILROAD GAZETTE].

Air Brake Materials: 3 crossheads No. 6, Plate B. 15	A C
3 lever brackets, air piston	A C
8 driver brake cylinders, upper head	A C
2 tender drain cups	A C
2 car drain cups	A C
3 triple valve brackets	A C
55 cylinder lever guides	Z
10 air drum push rods	Z
Axles: 12 small for A, B and C cars, 3½ × 5 journals	A C
Beads: See Nails.	
Brushes: (No stock).	
Burners: See Lamps.	
Chains: (No stock).	
Couplers: See Manufactured Material.	
Engine Fittings: 26 Reverse lever latch springs	A C
Files: See Tools.	
Gauges: (No stock.)	
Hardware, Heavy: (No stock.)	
Injectors: See Engine Fittings.	
Iron, Bar; 14 bars, 1, ⅛×3, ¾×30 in	Z
7 bars, 1, ⅛×3, ¼×24 in	Z
Lumber: (No stock.)	
Nuts: 1 keg ⅜ in. Hex. tapped	C
Pipe: 3 6-in. dry pipes 12 ft. long	A
2,000 ft. ⅜-in. iron	Z
1,000 ft. 3-in. tile	C
700 ft. 6-in. tile	C
500 ft. ⅜-in. gas	Z
Rivets: (No stock.)	
Sewer Pipe and Crockery Ware: (No stock.)	
Steel: 5 bars, ⅜ × 3 in. spring	Z
10 bars, ⅜ in. × ⅛ in. spring	Z
1 bar, ¾ in. × 2 in., ⅛-in. Jessup	Z
1 bar, ⅜ in. × 3 in., ⅛-in. Jessup	Z
3 bars, 1, ⅜ in. Octagon Crescent	Z
7 bars, 1, ¼ in. Octagon Crescent	Z
40 steel centre plates, top	Z
40 steel centre plates, bottom	Z
Track Material: 10,000 ¼ × ½ in. oak shims	C
1,040 angle bars 5 × 5 × 5 56-lb. steel	Z
115 pairs angle bars, 44 in., 85-lb. steel	A
100 base plates and angle bars for pattern F joint	A
1 rail bender, second hand	C
50 sighting boards	C
20 automatic track drills	C

The Deep Waterway and the Harbors of Lake Erie.

BY GEO. Y. WISNER, M. AM. SOC. C. E.

For two-thirds of a century the general government has endeavored to keep pace with the demands of commerce for better and safer harbor facilities at Lake Erie ports, during which time over $8,000,000 has been expended in deepening the harbor entrances and in building protecting breakwaters.

The natural depths at these harbors, previous to being improved, were from 2 to 10 ft., and that now maintained by annual dredging at seven of the principals ports of the lake is about 17 ft. at mean lake level; but as the cost of increasing the depth of all the entrances to about 9 ft. was small, the above amount was practically expended in obtaining an average increase in depth of 8 ft. or about $1,000,000 for each foot in depth thus obtained. During the session of Congress of 1892, $3,000,000 was appropriated to construct a 20-ft. channel from Lake Superior to Lake Erie; and as a deep water channel terminating in an open lake having harbors of much less depth than the proposed waterway will be of but little value to commerce, it becomes important to consider how these harbors are to be improved and at what cost.

There is no doubt that a majority of the Congressmen who voted for this deep water measure supposed that when the work should be completed there would be a 20-ft. navigable channel through the entire chain of lakes and connecting waterways. It, however, needs but a casual examination of the physical conditions of the problem to see that such will by no means be the case, and that the proposed 20-ft. canal from Buffalo to New York, if ever constructed, will have its western terminus in a waterway having at times a depth of less than 15 ft. The natural fluctuation of the lake surface is such that it is often over one foot below mean lake level, and a strong westerly wind will lower the surface at the head of the lake three to four feet more, while a similar wind from the eastward will produce like results at Buffalo. Heavy gales will lower the water surface at head of lake from seven to eight feet, but as these are not of frequent occurrence nor of long duration, they need not be taken into account in discussing the depth of channel that will probably be required by the future commerce of the lakes. These great changes of level from wind effect are due to the shallowness of the water and a wind blowing on shore seldom raises the surface of the lake more than half as much as a similar wind would depress the surface when blowing from an opposite direction.

Taking into consideration the fluctuation to which the lake surface is at all times liable, a minimum depth of 23 ft. at mean lake level would seem to be the least allowable for the main channel and for Buffalo harbor, and 20 ft. for local harbors. With the exception of Toledo the principal ports on the south shore of the lake are not liable to so great fluctuations of water levels as at Buffalo and the head of the lake, and, consequently, will not require entrance depths as great as that of the main channel.

From the condition above stated, it would appear that in order to secure a 20-ft. navigable channel through the lake and into the harbors for the greater portion of each season, the main channel through the shoals at the head of the lake will need at least three feet greater depth than that now contracted for—the entrance to Buffalo Harbor an increase of six feet in depth, and the harbors along the south shore of the lake an increase of three feet.

Low water in Lake Erie also has a direct effect on the depths through the Lime Kiln crossing of Detroit River and the shoals in Lake St. Clair. Since, under the plan of improvement of these harbors that has been in vogue for over sixty years, it costs $1,000,000 for each foot increase in depth, it is evident that if the same system is continued in the future, $6,000,000 would be a moderate estimate of the amount that will be needed to increase the depth of channels through Lake St. Clair, Detroit River and Lake Erie to the minimum depth that will be required, and to improve the harbors of the lake so as to admit the vessels that will then be built for the lake traffic.

A brief review of the work that has been done at some of the principal harbors of the lake, and the results that have been obtained, will illustrate the uncertainty of maintaining channels of greater depth by dredging.

At Buffalo harbor the first work of improvement was commenced by the State of New York in 1819, previous to which date the mouth of the river was closed a large part of each year by a sand and gravel bar. These works consisted of two parallel piers about 180 ft. apart and 1,000 ft. long, extending into the lake from each side of the river entrance. In 1826 the improvement was transferred to the general government, but until 1868 the only work done was to keep the piers in repair and dredge the channel. A detached breakwater was then commenced in about 27 ft. of water and a half mile outside of the entrance to piers, and designed to extend 7,600 ft. southward from the line of piers. Strong littoral currents flow northward and transport large amounts of sand across the entrance channel, the deposits from which have a constant tendency to produce shoaling. Up to the present time $2,763,000 have been expended in improving and maintaining the entrance to the harbor.

At Erie attention was called to the necessity of improving that harbor at the close of the war of 1812, when Commodore Perry anchored his fleet there after his memorable battle. A survey of the harbor was made in 1819 which shows a long, low sand bar across the entrance with a depth of 6 ft. on the crust. In 1824 work was commenced which, in 1830, increased the depth to 9 ft, and in 1864 to 12 ft. The plan of improvement consists of piers 350 ft. apart at the entrance to the bay, with the channel between and across the bar dredged to a depth of 17 ft. at mean lake level. The movement of sand eastward along the shore is very great, and has a constant tendency to produce shoaling in the dredged channel at harbor entrance. The amount thus far expended on the improvement and maintenance of the harbor is $871,000.

At Ashtabula attention was called to the desirability of improving the harbor in 1826 and plans adopted, consisting of piers 150 ft. apart and dredging across the bar. Rock bottom was found at 8 ft. below lake level, which has made the improvement very expensive. At present a narrow channel 17 ft. deep is maintained between the piers and across the bar outside, but the movement of sand across the entrance is such that a single storm may obliterate the results of an entire season's appropriation. The amount thus far expended in making and maintaining the harbor is $518,000.

The work of improving the harbor at Cleveland was commenced in 1825, at which time the depth on the bar across the mouth of river was only 4 ft., which has since

been increased to 17 ft. by confining the river flow between piers 160 to 200 ft. apart and by dredging. In 1875 a breakwater was commenced in front of the entrance in 30 ft. of water, which extends to the west of entrance about 4,000 ft. and then connects with the shore, forming an outside harbor and anchorage. This basin is fast silting up, the entrance having at present only 14 ft., where formerly the depth was over 20 ft. A bar is forming between the ends of piers and breakwater which requires dredging annually to maintain depth of channel required. The amount that has been expended on the harbor up to date is $1,348,000.

At Toledo the natural channel across Maumee Bay was very narrow and about 11 ft. deep, which has since been improved by dredging to a depth of about 17 ft. at mean lake level. This channel, however, silts up at the rate of six inches to one foot per year; and if maintained by the present methods will certainly furnish permanent work for contractors.

From the above it is evident that if these harbors are given 3 ft. greater depth by dredging, the maintenance of such depth, even if possible, will cost enormous sums. It is, however, safe to state that if the civil engineers of the country should be asked to bid on the proposition to increase the depth of the main channel from 20 ft. to 23 ft. and that of the local ports from 17 ft. to 20 ft. at mean lake level, the amount asked would be less than $600,000, or 10 per cent. of what the cost would be if done by the present system of dredging.

A dam built across the head of the Niagara River, of sufficient height to raise the lake level 3 ft. for a discharge of 240,000 cu. ft. per second, corresponding to that of the present mean level of the lake, would have no damaging effect on the harbor property, as the stage for maximum discharge would be but little greater than under the present conditions, and would have no effect on the extreme high stage produced by storms, which with the wind blowing 70 miles per hour has exceeded 7 ft. above lake level at Buffalo. The head of Niagara River is particularly well adapted for the construction of improvements of this character. From a width of two miles at the foot of the lake it gradually narrows to 1,500 ft., with a depth of 20 ft. and a mean velocity of five to six miles per hour. Below the rapids the cross section of river is nearly three times that of the restricted section, and consequently, whatever the stage of water in lake may be, the fluctuation of the water surface below the rapids will always be small. With these conditions a regulating dam, with lock for passage of vessels, can be designed that will give any desired elevation for the lake surface for a discharge corresponding to that of the present lake level.

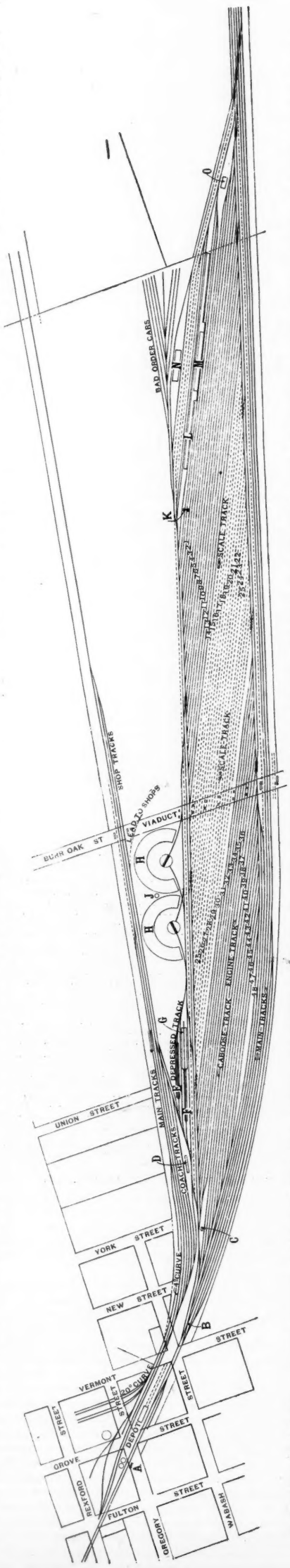
It is possible that an examination of the condition of the shores and wharves at the various harbors would show that a greater elevation than 3 ft. would be allowable, but whatever such level may be the increase in depth obtained will be at much less cost and of greater permanency than can be obtained by any other method. With the data now available, the location, dimensions and estimated cost cannot be definitely stated, and for this reason it is important that if a commission should be appointed to make a survey and estimate for a deep water canal from Buffalo to tidewater, its members should be instructed to investigate and report on the best method of improving the channels and harbors of Lake Erie.

It has been stated that the present depth maintained at the local harbors of Lake Erie is sufficient for the commerce of the ports, but there can be no question that to side-track these harbors in reference to the deep water channel would simply build up the business of Buffalo with the loss of commerce at the local ports. The cities at these ports have certain vested rights which cannot justly be destroyed, and consequently their harbors should receive a fair share of whatever improvements are made.

Detroit, Jan. 26, 1893.

The Blue Island Yard of the Chicago, Rock Island & Pacific.

The Chicago, Rock Island & Pacific has very nearly completed at Blue Island, which is about 16 miles from the terminal station in Chicago, a very large freight yard of which the general plan is shown by the accompanying engraving. The yard is placed between the main tracks and the "dummy" line, which branches to the west from the main line at about Eighty-eighth street and joins it again at Blue Island. The completed yard will contain about 20 miles of track, and will ultimately have a capacity for about 3,000 freight cars. This yard will be used as the general freight terminal and all incoming trains will be broken up here and outgoing trains made up. The transfer house which is shown on the plan measures 350 × 20 ft., with an office part of 35 × 50 ft., and a transfer shed 300 ft. long at either end, making a structure 950 ft. long over all. In addition to this a 30-stall roundhouse, a 60 pocket coal chute, a blacksmith shop and an ice house have been built. The tracks shown by full lines have been laid, while proposed tracks are shown in dotted lines. Where Burr Oak street crosses the yard a viaduct 20-ft. wide and costing in the neighborhood of $30,000 has been erected. The main part of the viaduct is a little over 883 ft. long between the piers and the approaches are 505 ft. long, giving a total length of over 1,388 ft.



BLUE ISLAND FREIGHT YARD—CHICAGO, ROCK ISLAND & PACIFIC RAILWAY.

The left of the diagram is South, the right North.

A, stand-pipe; C, switchmen; D, coach cleaners; E, clinker pit, 300 ft. long; F, incline to coalhouse; G, coalhouse, 60 pockets; H H, roundhouses; J, stand pipe; K, derrick; L, platform, 16 × 350 ft.; M, transfer-house, 20 × 300 ft.; N, icehouse, 30 × 100 ft.; O, telegraph office.

English Electric Rolling Stock.

Considerable attention has for some time past been paid in England to the new electrical system of the South Staffordshire tramway, running through what is known as the Black Country; and as a model of an improved overhead trolley system this line deserves commendation. The details of the flexible joints in the trolley pole and wheel, by means of which the objectionable span wires *across* the street or line of route are avoided, and a single row of poles on one side found sufficient, will by this time be familiar to tramway men throughout the United States, from the descriptions that have appeared from time to time during the past few months in the technical papers making a specialty of such matters and it is hardly necessary to reproduce them in these pages. Many of our readers, however, will take an interest in some particulars with which we have been favored by Messrs. Brown, Marshalls & Co., Ltd., of Birmingham, England, respecting the double decked cars used on this line. These cars have been specially designed and built for the new electric service by the above named firm.

Each of the new cars is constructed to carry 39 passengers, namely, 18 inside and 21 on the roof; it being understood, of course, that seating accommodation for this number is implied. The rule in England is to allow no overcrowding; no more passengers are supposed to board the car than are able to find seats. The extreme length over the platforms is 22 ft., the length of body being 14 ft. 3 in., and the width outside, over moldings, 5 ft. 9 in. The bottom framing is built of Moulmein teak, strengthened on the outside with channel iron that runs all round the car, and is joined at the steps. The framing of the body and roof is of white English ash, with panels of mahogany. The inside of the car is paneled with canary pine, relieved with oak moldings, while the roof is formed of narrow boards of pitch pine, the whole being polished and varnished. The benches both inside and outside are fixed transversely across the car, and are of the "garden seat" type, with reversible backs. Those inside are provided each with a rug, and those on the roof with waterproof aprons. The floors both inside and out are of pitch pine, striped with hard wood laths. The windows are provided with handsome curtains, sliding on brass rods in the usual way.

The motor truck is of the "cantilever" type, with side frames of pressed steel. Channel and angle steel cross bars and stays, firmly riveted together, help to secure a good solid truck. The car wheels are 2 ft. 9 in. diameter, with rolled steel tires and cast steel centres. The axles are of forged mild steel, of length suitable for a 3 ft. 6 in. gauge. Double brakes are provided at each end of the car, the ordinary brake working the shoes on the outside of the tires and the emergency brake working the shoes on the inside. The axle boxes are of cast steel fitted with gun metal bearings and spring lubricating pads. The car springs are of steel coil with India rubber centres.

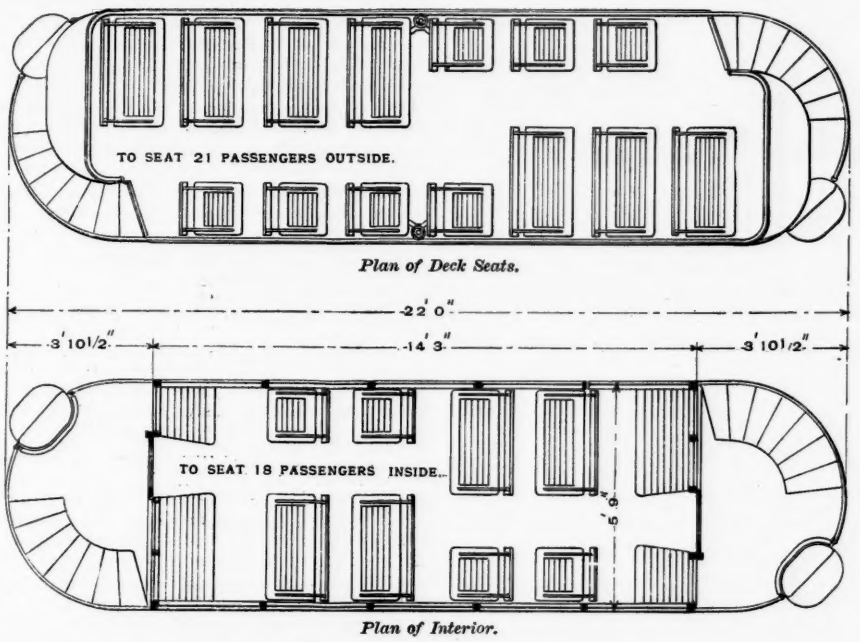
Each car is provided with two sandboxes at each end of the car; these being filled and discharged from the platform. In addition to the ordinary bell for starting and stopping, two alarm bells with pedal action for the driver's use are fixed underneath the platform. Of course the inside of the car is lighted by electricity—one lamp being placed at each end and one in the middle. The cars are painted a rich lake color, with upper panels of cream, all picked out and fine lined.

The illustrations which we append will serve to show the type of car thus described. The engraving, reproduced from a photograph, represents one of these cars in the makers' yard before receiving its electrical equipment. The outline drawings give plans respectively of the roof and interior, showing the position and arrangement of the seats, etc.

Massachusetts Railroad Commissioners' Report.

The Railroad Commissioners of Massachusetts, John E. Sanford, Everett A. Stevens and William J. Dale, have issued the 24th annual report of that Board. The first subject discussed is progress in railroad building, from which we find that there is practically no progress at all in Massachusetts. The length of road built during the year ending June 30 was eight miles, and the total now in operation is 2,095 miles, equal to 1¼ per cent. of the mileage of the United States. Massachusetts has, however, more railroad in proportion to its territory than any other state except New Jersey. Belgium has a mile of railroad to 3.48 square miles of territory, and is the only country that is better supplied than New Jersey and Massachusetts. Twenty years ago Massachusetts had 36 railroads, and now eight of these operate 2,013 miles out of the 2,095 miles in the state; and the remaining 82 miles, half of which is narrow gauge, is operated by eight companies. The Commissioners go on to say that the "railroad problem" in Massachusetts is not one of construction, but of administration, and discuss the subject in an enlightened manner. The railroad which by a broad and liberal policy promotes the interests of the public most surely advances its own interests. "This is not a mere ideal standard or theory of railroad administration which must await some future millennial period in railroad history for its realization. In greater or less degree, and in increasing measure, it is already finding practical illustration in the management of some of the railroads in this state to the mani

fest gain of the public and with corresponding benefit to the corporation. With respect to other roads it cannot be said to have had as yet a perceptible influence in liberalizing the spirit and elevating the standards of management. Its adoption to any extent marks a distinct advance in the policy and methods of railroad administration. Further progress in this direction will not be best secured by means of direct compulsory legislation, but will rather be the outcome of agitation and discussion, of the pressure of public opinion, of a larger intelligence and more enlightened spirit in railroad management and a more thorough conviction that the interests of the corporation and the public interests lie along the same line of policy."



Plan of Deck Seats.

Plan of Interior.

Car for the South Staffordshire Electric Tramway.

The Commissioners discuss the problem of a union station on the north side of Boston, involving the abolition of numerous grade crossings, and refer to the report of the board last year, in which this problem was treated somewhat exhaustively. The engineer of the Rapid Transit Commission, working independently of the Railroad Commissioners, presented substantially the same plan that they did. But, "in the face of these reports and plans, in disregard of the urgent public demand for relief from discomfort and dangers long endured, and with an apparent want of comprehension of the possibilities of the future, the Boston & Maine now proposes to adopt a mere makeshift, or at best half-way plan. . . . " The report then goes on to recommend that the state and the cities interested take hold of the project, and that the state pay not only the usual 25 per cent. allowed from the state treasury in changing grade crossings, but perhaps a larger percentage, as was done in the case of the Old Colony improvements on the south side of Boston.

The next chapter is on regulation of rates. It tells how rates have fallen during 20 years and how little legislation has taken place. The Commissioners have power to fix rates on only one commodity, milk by the can. This power has been exercised in but two instances and these orders have been challenged in the courts. "The legislature has, however, placed in the hands of the board a more persuasive and effective appliance for the regulation of rates than legal compulsion—that of investigation, criticism and publicity. Upon complaint or otherwise, it is made the duty of the board, whenever it deems that a change in the freight or passenger rates on any railroad is reasonable and expedient in the public interest, to inform the corporation in writing of the changes which it considers to be proper, and to publish the proceedings in its next annual report. The formal recommendation of the Board, after notice and a public hearing, for an alteration or reduction of rates, has very rarely been disregarded; and, upon calling attention to alleged grievances, its suggestions have often been adopted without any formal proceedings."

The Commissioners then explain the difficulty of prescribing equitable rates by law and say that Massachusetts has every reason to be satisfied with the results of her policy. Passenger fares are probably lower than in any other state, and freight rates are as low as in any state whose business is similar. The Commissioners note the reduction of the difference between rates from the West to Boston and those to New York which was made last August in consequence of the investigation and report of the Interstate Commerce Commission. The action of the Board in the matter of interchangeable mileage tickets, which were ordered by the legislature last year, is set forth, but the subject is not discussed because it is now before the courts.

Practically all the passenger trains in the state are now heated by steam from the locomotive. A few mixed trains have been exempted, and it is expected that some of these will come within the law by next winter. The subject of freight car couplers is discussed, and national and state statistics of personal injuries quoted. The O'Neill bill, pending before Congress, is mentioned. No definite recommendation is made, but the whole subject is succinctly set forth, concluding as follows:

Many of the railroad companies are making and have already made substantial progress in the directions indicated. Other companies will be compelled by the necessities of traffic, if not by public pressure, to follow in their lead. The voluntary adoption of the proposed safeguards in advance of the dates suggested in the bill would be more than probable, and uniformity would thus be secured in the most desirable way.

The law of 1890 to promote the abolition of grade crossings was modified last year so as to give the Railroad Commissioners power to change the grade of a railroad to facilitate the abolition of a crossing, the special commissioners provided for in the law having been forbidden to exercise this power. The Railroad Commissioners decide that they are not required to examine the whole subject of a crossing, but simply the raising or lowering of the railroad tracks, with special reference to the interests of the public using the railroad. Under the law of 1890 proceedings have been instituted for the abolition of 108 highway grade crossings. Under the law each crossing is considered by a special commission of three persons. Many of these cases require long negotiations, and the report does not state how many of the cases have been settled. On the Boston & Albany all grade crossings between Worcester and Springfield, 54 miles, have been abolished or the work is now in progress. The legislature has passed special laws for important changes of this nature in Newton, Brockton and Boston. Speaking of the cost incurred by the state the report says:

It was provided in the act of 1890 that the amount to be paid under that act by the Commonwealth in any one year, beginning June 21, 1890, should not exceed $500,000; and that the total amount to be so paid should not exceed $5,000,000. The total estimated cost of the abolition of the grade crossings, on which special commissions have made reports since the passage of that act, is as follows:

For the year ending June 30, 1891	$379,959	
Commonwealth's proportion		$94,990
For the year ending June 30, 1892	278,874	
Commonwealth's proportion		69,718
For the six months ending Dec. 31, 1892	725,644	
Commonwealth's proportion		181,411
Total	$1,384,477	$346,119

The importance of more efficient brake power on fast trains is vigorously discussed, and the action of the Old Colony in putting brakes on the forward truck wheels of two locomotives is commended. "The Boston & Albany has also taken an active interest in the problem; and the Board is informed that the Westinghouse Air Brake Company is now furnishing equipment of this kind to quite a number of railroads, including the New York Central, the Pennsylvania and the Lake Shore. It is earnestly to be hoped that in the near future all of our railroads will run their passenger trains with every wheel braked." The Commissioners have observed with gratification the tests at Altoona of a Westinghouse brake arranged to produce the greatest pressure on the wheels at the beginning of the stop.

A table is printed showing the number of cars and engines equipped on each of the principal roads. From this it appears that on these roads 52 per cent. of the passenger engines have driver brakes, and 67 per cent. of the freight engines; 42 per cent. of the passenger cars have quick acting brakes, and practically all the six-wheel trucks owned by the roads have brakes on all wheels, but there are only a few such cars. Of the freight cars owned by these roads nine per cent. have train brakes. Equally full statistics are given of freight car couplers; 13 per cent. of the cars have M. C. B. couplers. The Boston & Albany has two-thirds of its freight cars thus equipped. The percentage on all the other roads is small. This road has the quick acting brake on all its passenger cars, but the New York, New Haven & Hartford has it on only about one-quarter of them. The New York & New England has it on all, and the Fitchburg on only one-fifth. The Boston & Maine has it on one-ninth of the cars. The Boston & Albany has air brakes on one-third of its freight cars, the Boston & Maine on none, and the other large roads on from 2 to 10 per cent.

The report sets forth the value of the space interva system of running trains, and holds that the superiority of this over the time interval is being daily demonstrated. Reference is made to the progress of signaling throughout the country, and the mileage of block signals (nearly all automatic) on the roads reporting is given in detail. This account also includes a statement of the number of interlocking plants, but the information is not given in tabular form. The chapter concludes:

Very much remains to be done in this direction. There are important and much traveled lines in this state on which trains are still attempted to be run on the old schedule or time-interval system. The most thoroughly equipped and best conducted railroads are rapidly abandoning it, and in a few years no railroad will be regarded as well equipped or well managed, either in the interest of the company or in point of public safety, which is not fully provided with block and interlocking signals for the running of trains on all of its regular lines of travel.

Car for the South Staffordshire Electric Tramway.

The accident records for the year to June 30 show:

Collisions	15
Derailments	7

	Killed.	Injured.
Passengers	16	112
Employés	24	540
Persons at highway crossings	32	39
Persons at stations	8	12
Trespassers	127	102
Total	267	805

The total number of casualties reported is much larger than for the preceding year. This is largely due to the fact that the Boston & Albany has reported many minor accidents of a kind heretofore omitted, and apparently not so fully reported by any other company. The usual averages and comparisons are published, from which it appears that the estimated passenger mileage in the state was 1,277,150,000. No passenger was killed in a train accident and the number injured was 40. The number of persons injured at grade crossings is compared with the number of crossings on each road. On the Boston & Albany there was one injury to 46 crossings; on the Connecticut River, 1 to 12; on the Old Colony, 1 to 55. Only 71 persons were killed or injured

at crossings during the year. The Commissioners regard this as fortunate and add:

Supposing 25 trains a day pass each of the 2,216 grade crossings in the state (and there are hundreds of trains which pass daily over some of them); in a year of 313 days it would be equivalent to more than 18,000,000 passages of trains over a grade crossing, and 253,520 trains would cross before a person was injured.

The usual statistical tables are printed, special prominence being given to the flour and grain trade of Boston. Among the most interesting tables are the earnings per passenger train-mile and freight train-mile for each road for five years. The quarterly financial statements, which, under the law of 1889, are sent to the board by the roads, are kept open for public inspection and are much availed of for information by interested parties.

Fig. 5.

The special report of Mr. George F. Swain on the railroad bridges of the state is summarized in another article.

The part of the report relating to street railroads contains reports of 60 companies. The total length of street railroad track Sept. 30, 1892, was 814 miles, an increase of 140 miles over last year. Of this total 492 miles are operated in whole or in part by electric power, and 322 miles wholly by horse power. One company (at Milford) is using the storage battery, and all the rest overhead wires. The aggregate capital stock of all the companies reporting is $23,540,536, an increase of $3,986,583 over the previous year.

The average cost for each of mile track is $47,356. Whole number of cars owned, 3,659; increase, 165; total number of passengers carried, 193,760,783; increase, 17,670,594; gross income for year, $9,817,537; increase, $916,413; gross expenses, $7,461,224; increase, $338,931; net income, $2,356,312; increase, $577,482; average sum received for the conveyance of a passenger, 5.07 cents; average cost of carrying a passenger, 3.85 cents; whole amount of dividends paid, $1,582,697, an average of 6.72 per cent. on the total amount of capital stock, as against 5.63 per cent. the previous year. Total number of accidents, 610, of which 26 were fatal.

Freight Warehouse, Southern Pacific Company.

The Southern Pacific Company has lately built at New Orleans a four-story freight warehouse the ground floor of which will be used as a receiving depot for inward freights, which consist principally of rice, sugar and sacked grain. The upper floors are designed to store this produce after the legal allowance to consignees for removal has expired. The greatest trouble in handling freight at New Orleans comes from the fact that during three or four months of the busiest season in the winter, when the crops are moving, the railroads bring freight into the city in such quantities as to overtax the storage capacity.

The building, which is of light colored brick, is situated on the river front, with a frontage of 372 ft. on Water and Delta streets and 125 ft. on Poydras and Lafayette streets. Three tracks run through the building, the middle one of which is used to place cars at the other stations in the same line of blocks with this one. The side tracks are for unloading, and enable 22 cars to be unloaded at one time.

The building rests on piles, 2,200 of which, in groups of six, nine and twelve, were driven under the piers and walls. They are of yellow pine, 46 ft. in length, driven their entire length, the bearing being entirely from the skin friction.

The piers (fig. 3) are of brick, capped with granite blocks, supporting the timber posts, which are 15 in. × 15 in., and 18 in. × 18 in. at the span over the tracks (see plan of ground floor, fig. 1). As heavy timbers as possible are used in the construction, and the floors are also thick, so that in case of fire the burning would be slow, and thus enable it to be confined to one floor. The girders are of two 7 in. × 18 in. timbers, bolted together, and rest in the wall on cast-iron girder seats (see fig. 2). The floor beams are 5 in. × 16 in., placed 30 in. apart, the bearing for which in the walls, is shown in plan and elevation in figs. 6 and 7. At the top floor, at the section 35 ft. wide, over the tracks, the timber girders are replaced by steel girders. The bracing at the columns supporting these is shown in side and end elevation in figs. 8 and 9.

The main roof rafters are 4 × 10 in., placed 8 ft. 10 in c. to c. The central span is trussed by two 1¼-in. rods, the mode of fastening which is shown in front and end view in figs. 10 and 11. Fig. 12 is a section at centre of span. The roof has very thick timbers throughout and has a tar and shell covering. A good idea of the arrangement of these details and of the building in general is to be had from fig. 2, which is a part of the cross section on Lafayette street.

Fig. 3 shows the piers and their foundations, and also the lower floor construction of the same.

Fig. 5 is the elevation of half this Lafayette street end. Fig. 4 is a part longitudinal section showing one of the four endless chain elevators for hoisting barrels and other freight.

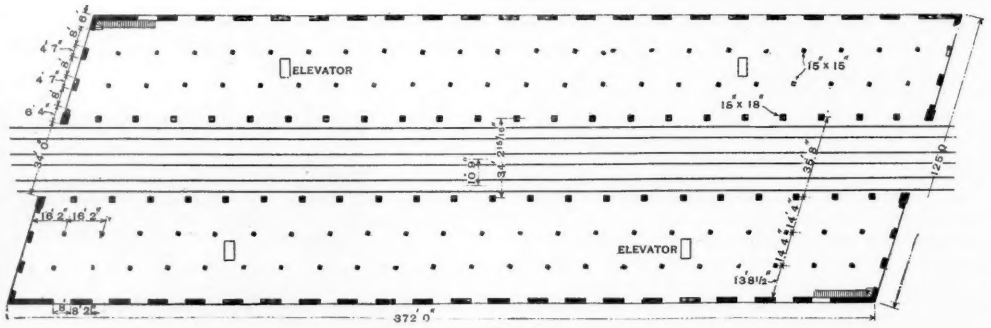


Fig. 1.

New Orleans Freight Warehouse—Southern Pacific Company.

Railroad Bridges in Massachusetts.

In the annual report of the Massachusetts Railroad Commisioners, which is just issued, Prof. Geo. F. Swain, of the Massachusetts Institute of Technology, reviews at considerable length the work of the Commission in collecting statistics of various sorts about the bridges in the state and in bringing about improvements in bridge details. By the Massachusetts law, the railroad companies are required to make biennial reports to the Board regarding the condition of their bridges. In the past year these reports have been examined and compared with previous ones, and many of the structures have been examined in the field.

The first table presented by Mr. Swain shows the total number of bridges of various classes. In this table each span of truss bridge, plate girder or wooden stringer resting on masonry is counted as a bridge; while wooden trestles and pile bridges are counted as one bridge each, irrespective of their length. We give below the totals from the table. The table itself gives a careful classification of the bridges on each railroad in the State.

Total spans stone or brick bridges	180
Total wooden and combination bridges, fixed spans	551
Total iron bridges, fixed spans	926
Total movable bridges	28
Grand total	1,695
Total length of pile and trestle bridging	53,430

Another table gives particulars for each railroad of bridges renewed or exclusively repaired since 1887. We give the totals only.

Rebuilt or built new	473
Extensively repaired or strengthened	196
Per cent. new	27.8
Per cent. new or extensively repaired	39.4

A statement is given in considerable detail of the changes that have been made on each railroad since 1887, and from this statement we take a few interesting facts. The Boston & Maine has a greater number of bridges in the state than any other road; 27 per cent. of its bridges have been built new since 1887 and 35 per cent. have been either built new or strengthened during that period. On the Boston, Revere Beach & Lynn the bridges have been almost entirely reconstructed in five years, excepting those which were then practically new. On the Connecticut River Railroad a great deal has been done to bring the bridges up to a very high standard. Out of nine trusses, eight are new within the past 10 years and the other one has been strengthened. Of 21 plate girders, five are new and 15 have been built since 1881. The floors have all been brought up to a high standard, having inside guard rails brought to a point and outside guard rails overlapping the inside rails. On the Old Colony system a great deal of work has been done. On the Providence Division, for instance, 11 plate girders out of 12 are new, and of 11 short-span I-beam bridges three are new and five have been strengthened.

Considerable improvement has been made in the last five years in the matter of bridge floors. On every railroad in the state the standard spacing of ties is now 8 in. or less in the clear, while on several roads it is 4 or 5 in. In 1887 inside guard rails were standard on only the New York & New England, the Providence & Worcester and the Connecticut River, although they were largely used on the Old Colony and on some divisions of the Boston & Maine. No re-railing frogs were in use excepting a few on the Troy & Greenfield. In the past five years all the bridges on the Old Colony, all the principal bridges on the Boston & Maine and a number on the New London Northern and the Cheshire have been provided with inside guard rails. The Old Colony has put re-railing frogs on five bridges, and the Boston & Albany will use them on some of its drawbridges. The Connecticut River and the New York, New Haven & Hartford have adopted inside guard rails, with overlapping outside rails, and have placed this system on all of their important bridges. The Boston & Albany continues to use practically no guard rails. The Housatonic also has none and on the Fitchburg outside rails are still standard.

Mr. Swain gives tables showing by individual railroads and by classes of locomotives the increase in weight of engines from 1887 to 1892. The tables give weight on driving axle, total weight of engine, weight of engine and tender and weights per foot of wheel base. The details are interesting, but do not seem to be important enough to warrant reprinting, but we extract a few facts comparing the weights of the heaviest engines in the state. In 1887 the heaviest 8-wheel passenger engine weighed 98,000 lbs., and was run on the New York & New England. In 1892 the heaviest engine of this class weighed 112,590 lbs., and was run on the New York, New Haven & Hartford. In 1887 the heaviest mogul weighed 106,700 lbs., on the Providence & Worcester. In 1892 the heaviest mogul weighed 129,100 lbs., on the New York & New England. The heaviest 10-wheeler in 1887 weighed 103,400 lbs., on the Boston & Lowell; in 1892 it weighed 132,500 lbs., on the New York & New England. The heaviest consolidation in 1887 was on the Boston & Albany, weighing 120,000 lbs. On the same road the same class now weighs 130,000 lbs. The greatest increase of weight in engines on one road appears to have been on the New York & New England where heavy moguls and 10-wheelers have been brought into use in the last five years.

Considerable space is given to an abstract of cases of bridge accidents from the earliest records down to the present time. Of these Mr. Swain finds that there have been 12 in the State which have resulted in the loss of 33 lives. Three of these may be said to have been due to the giving way of the structure from inherent weakness. Six have been due to derailed trains, one to washing out of foundations and two to trains falling through drawbridges. Mr. Swain's conclusion from this is, that it illustrates the importance of having bridge floors constructed in the best possible manner. It shows that comparatively few bridges break down from inherent weakness, but that one-half of the bridge accidents which have occurred in the state have been caused by the fact that their floors were not designed to carry derailed trains.

Test-Loads for Bridges.

Those who favor the application of test-loads to new bridges before giving them over to traffic, says the *Zeitschrift* of the Austrian Engineers' and Architects' Society, refer now to the recent case of an iron highway bridge in Servia, which collapsed when the test-load had reached about 130 tons, while it had been calculated to sustain 155 tons.

Couplers and Deadwoods for Freight Cars.*

Mr. RHODES: It is about a year ago that a member of this Club was busily engaged on a report, the object of which was to improve and raise the standard of efficiency of the M. C. B. Coupler. The report, a very interesting one, was presented to this Club in February. I believe it will pay us to consider a little what the result of that report has been and what progress has been made since its presentation. One of the moves made by this paper was that of establishing some tests for the Master Car Builders' bar, with the view of raising its efficiency. The immediate result of the paper and the discussion that followed was action by the Master Car Builders' Committee on Couplers, which called a meeting at Pittsburgh of all those interested in the coupler question. As a result of this meeting, a report was presented at the annual convention, proposing for the first time certain standards of strength. There has been a good committee appointed to consider this subject further and to present it at the next annual meeting.

One year ago no one had any very good idea of what should constitute a very strong coupler. No one had a very good idea of what a coupler should stand under a drop test. No one had any good idea of what the pull should be. At the present time there is hardly a coupler company but that has facilities for making the drop test, and some even now have pulling test facilities and are willing to sell their bars under tests. This is a tremendous start. As to what we shall do for the year 1893, I would first like to ask those who are interested in the manufacture of couplers not to think they are outside of action in this matter. They ought to consider that they should work with the members of the Association. They have their drop test now and their pulling tests. If they will take up this M. C. B. report and work up to it and try and see whether they can better these tests that have been recommended, or when they make their tests let them keep them tabulated in such form that we will be able to see what requirements they can meet. Much of the work that has been done under test has been done by manufacturers. The work done by the M. C. B. Association would not go very far but for the assistance we have had from the manufacturers, and I believe in this coupler business the manufacturers interested in putting their goods on the market can do more to assist in raising the standard than the railroads themselves.

The point, however, that I want to bring up particularly is this one: Whether we should use iron deadwoods or not with the M. C. B bar. A few years ago nearly all the lines in the East used iron deadwoods. Out in the West we never used them; they went by the name and still go by the name of "man killers." But I find that the feeling against the deadwoods is changing, and now that the automatic coupler is being used, the men who opposed the dead wood are no longer opposing it. But when we come to investigate it, we find the astonishing state of affairs that some of the lines in the East that have been most prominent in using iron deadwoods are abandoning them and putting on the M. C. B. bar without the deadwoods.

The fact is that three years ago we fitted up a train with deadwoods, without any authority, one of our construction trains, and what has been the result? There has been only one broken drawbar in that train during three years. The reason we have the record accurately is that the cars require a special kind of drawbar, and there has only one been bought in three years. No drawbars have been pulled out and there has been no complaint about having man killers on. The train has been kept together. It is a work train, and the very best results have been had on that train.

One of the objections to the use of deadwoods in connection with the M. C. B. bar is that they may not couple on curves, but if they do not couple on curves you can use a link. We don't think this objection a sufficient offset to the advantages that will be gained.

A MEMBER: I can understand that the deadwoods kept the bump off the cars, but I do not understand how they kept the draw from them.

Mr. RHODES: Without the dead blocks the draft rigging comes together without any relief. With iron dead blocks the draft rigging never gets quite as far together as it does without them, so the strain on the attachments is not so severe.

Mr. SCHROYER: When we commenced the use of the automatic bar we canvassed the question of deadwood blocks pretty thoroughly. There were three reasons why we did not use the double deadwood blocks, one of which was that it was not good under all conditions with the M. C. B. bar, that is, when the cars were brought together with the knuckles closed the bar took

* Abstract of a discussion at the Western Railway Club.

Fig. 6.

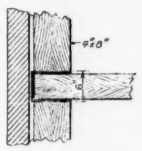


Fig. 8.

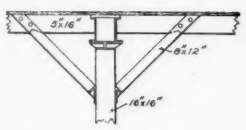


Fig. 9.

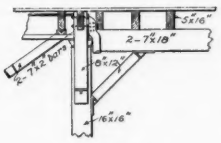
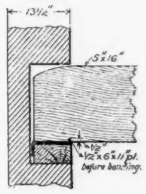


Fig. 7.



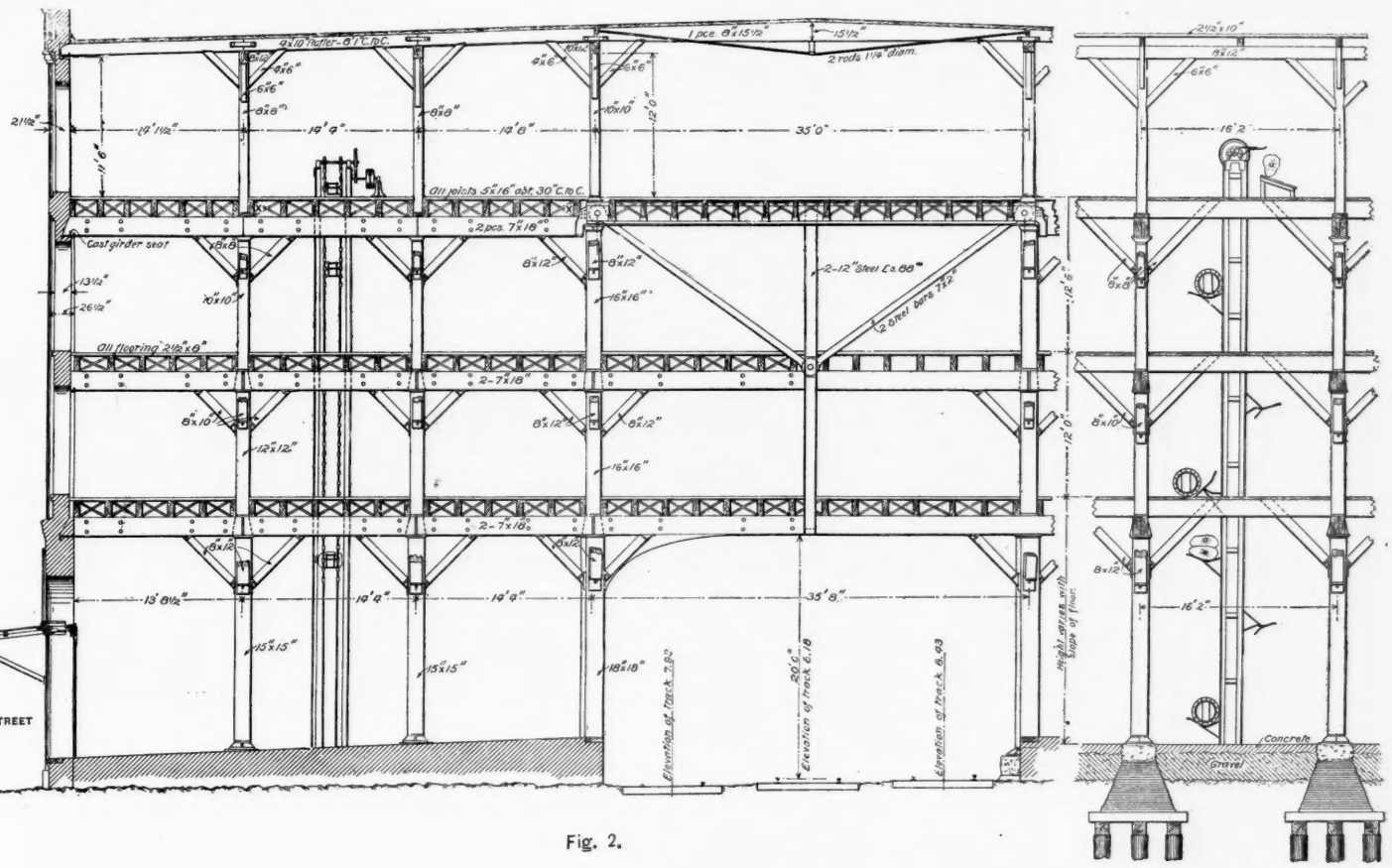


Fig. 2.

Fig. 4.

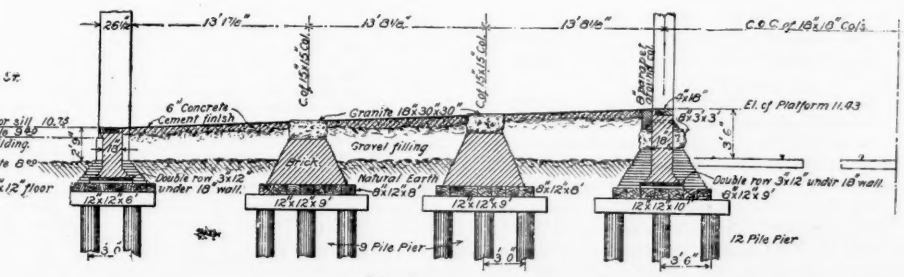


Fig. 3.

New Orleans Freight Warehouse—Southern Pacific Company.

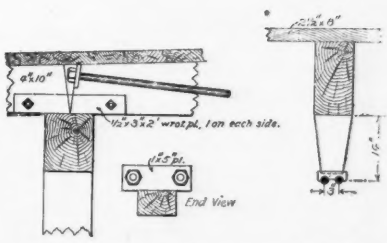


Fig. 10. Fig. 11. Fig. 12.

the entire shock. None of our neighbors were using them. Those were the two principal reasons.

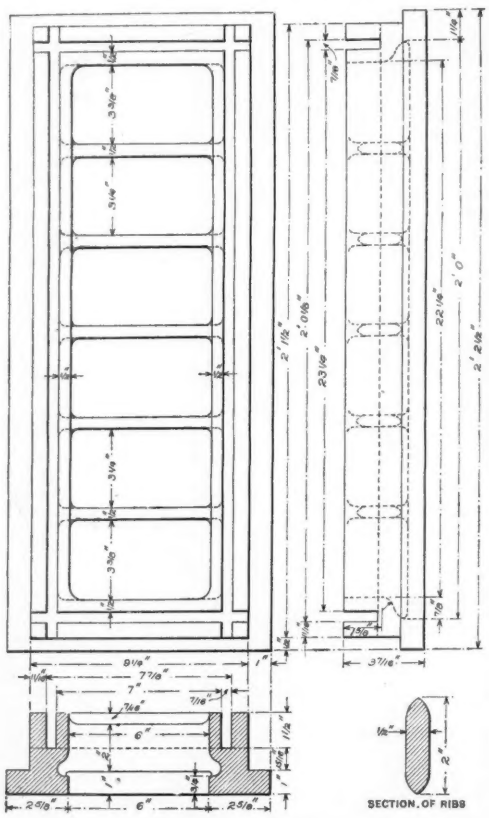
If there ever was a time when the double deadwood block should be used it is now. We are introducing the automatic bar, and are doing away with the necessity of going between the cars to couple up, and the only reason for not using them to-day is that they are not always operative. But assuming that they are operative 50 per cent. of the time they are saving the draft rigging of the car just that much. We have increased the strength of our draft rigging to meet the conditions that now exist in the use of the bar, and why it is that they should be abandoned and taken off is more than I can understand.

President LEWIS: Is it not possible that we get a more efficient service from the horn of the drawbar than we do from the deadwoods? Will it not be more effective in the case you mention when they come together with the knuckles closed? The horn will take the shock in all cases, where the deadwood will not.

Mr. SCHROYER: That is the case also, but the tendency in that is to break off the head of the bar because it produces a tensile strain on the bar which constantly tends to break off the head. That is one great cause of the breakage as we have found it, and we have also found that as the number of automatic bars increases in service we have more breakage in the gathering arms than anywhere else. Whether that is due to the coupling of the bars together or whether it is due to the coupling of the narrow link and pin bars, I am unable to say, but we find this condition prevailing very largely.

Low Pressure Valve for Dean Compound Locomotives.

In the *Railroad Gazette*, Nov. 25 and Dec. 23, 1892, some of the principal details of Mr. F. W. Dean's latest design of compound locomotive were illustrated. To these we now add the low-pressure valve for the most



Low Pressure Valve for Dean Compound Locomotive.

recent engine. This valve is of cast iron, is 26½ in. by 11¼ in., and is balanced as indicated by the drawing. Other details of the construction are so clearly shown by the drawing that no further description is necessary. Mention should be made, however, of the transverse ribs of which there are five, each ½ in. wide and 2 in. deep. The valve complete, with packing strips, weighs 116 lbs. It is for an engine having cylinders 20½ and 29 in. in diameter by 26 in. stroke. The high-pressure valve is of similar design and is 22½ in. by 12¾ in. and is strengthened by four transverse ribs.

George R. Blanchard on Pools.

At the hearing before the House Committee, at Washington, Jan. 26, on the proposed pooling law Mr. G. R. Blanchard, Commissioner of the Central Traffic Association, made an address from which we extract the following:

It has occurred to me in the progress of this discussion that what the members of this committee most need to know is what a pool is. Nobody has explained the details under which pools operate, and their importance and their wrongs have been magnified very much. I had the honor to be called to my present position in 1886, and, until the law went into effect, administered the pools out of Chicago, Peoria, St. Louis, Cincinnati, Detroit and Indianapolis. During that period the tonnage amounted to 14,800,000 tons. The transfers or payments made by the companies to each other were less than 1.2 per cent. of the entire revenues involved. The amount per ton on the 14,800,000 tons was less that 7 cents. This is the effect upon the public rights which is being discussed here to day, and no more.

This pool included all the business received in Cook County or passing through it in Illinois, destined through to the western termini of the trunk lines. Not one of the pool contracts to which I have referred mentioned a rate, or the proportion that any company was to receive. It is not proposed that they shall do so now. Those considerations are left to the currents of trade. For example, in the St. Louis pool, the corn crop of Southern Illinois ripening long before that of Northern states, that was taken into account and the percentages were adjusted to the months. After the warm sun had moved north changes were made. During the time from the beginning of the Chicago pools until the present there have been 13 arbitrations and 11 changes in the divisions.

Now, assume that we receive your authority to commence pooling May 1. What would be the first practical result? I have continuously kept statistics of the exact deliveries by the different lines to the various competing lines out of Chicago. There are 10 lines from Chicago to New York. Those 10 lines report their tonnage to my office. Now, the greatest diversion that has ever been made in percentage, not in tonnage, in any of these divisions from one to another is 1⅝ per cent. from what the proportions were as it was actually delivered by the public to the different railroads. What wrong can there be in that? Forty per cent. of the New York tariff rates was put into this pool and taken out, according to the proportions the public had given to the same lines for 20 years past. This division was made by such men as Mr. Potter, of the Union Pacific; Mr. McNulta, of the Wabash; and Mr. Cable, of the Rock Island. This 40 per cent. was paid into my office, and the money payments equalized themselves to 1.2 per cent. In many of these divisions the railroad company only knew its own proportion. They were not advised of what proportion was allowed to the other seven, eight or nine lines. They were simply asked at the end of stated periods to ascertain from their own records whether they had fallen short.

I was present at the organization of the westbound trunk line pool. It began in 1876 and continued until April 1, 1887, eleven years. At the time of its inception the average rate from New York to Chicago was 75 cents per 100 lbs., and in the first year it carried 758,000 tons. At the end of the 11 years the average rate was 48 cents, and the tonnage 1,311,000 tons. I have gone through the pools of the Western Freight Association, of the Southern Railway and Steamship Association, and the Panama pool with the overland lines, and in every one of those instances, rates were reduced and tonnage increased. There is not a single exception to that broad statement. The grain rate from Kansas City to Chicago was reduced approximately 22 per cent.

Now, as to the question of the rates. The Commission has already passed upon the tariffs we charge from Chicago to New York. They have said that 25 and 22½ cents on grain are reasonable rates. Judging by all the standards of the world they are unreasonably low; but our business has really, instead of paying 22½ and 25 cents, averaged a fraction under 19 cents.

Now, given the reasonable rate and the legal duty to maintain it, what matter is it to the public whether that rate is maintained among the roads upon the word of honor of Mr. Roberts and Mr. Depew or by the machinery of a pool? Is there any difference in it to any man who receives a barrel of flour? . . . As Professor Hadley, of Yale, said, the public does not care what the rates are, provided they are universal and equal. . . . It was not derogatory to the dignity of Mr. Gladstone or antagonistic to the interest of the British public that be awarded pools in England for 14 years. And if anybody cares to study the reports of the English Board of Trade he will find among them a report which states the results of this award.

Firebox Seam Protector.

The accompanying illustration shows a seam protector used with some success on the Pittsburgh & Western, and recently devised by Mr. W. J. Davis, General Foreman of the Foxbury shops on that road.

The protector forms an air passage which keeps the protector and rivets cool, and prevents the seam leaking and the rivet heads burning off, and is so clearly shown in the engraving that no description is necessary.

The protector is secured by one ¾-in. stud placed about 2 in. from the top of the protector and screwed into the side sheet projecting through the protector about ⅛ in. The protector is not placed any definite distance above the grate bars, but wherever the leak is found.

This device was first tried on an old firebox in which the flue sheet seam and rivets were nearly worn out owing to leakage which could not be stopped by calking. The protector was made from a bar 3 in. by 1⅛ in. bent to the shape of the side sheet and held in position by one ¾-in. stud, the length of the protector running the length of the leak. The seams have since run for six weeks without leaking a drop, while the experiment has since been tried on eight other engines with equally good results. The life of the protector is about two months. Mr. Davis estimates the cost of putting two protectors, one on each side of the box, at $1.50 to $2.00 including labor and material, while the cost of calking during the lifetime of a protector is about $12.00. This is not including the value of the engine's time when laid off and cooled down to allow the boiler makers to work.

This device is applicable, of course, to new engines, but as yet has only been applied to old engines.

A Knotty Grade Crossing Problem.

Massachusetts has a grade crossing law which is more favorable than that of any other state, but even there the difficulties are great, especially in cities. The Grafton street case, in Worcester, showing some of the causes of the long delays experienced, is described by the Boston *Herald* as follows:

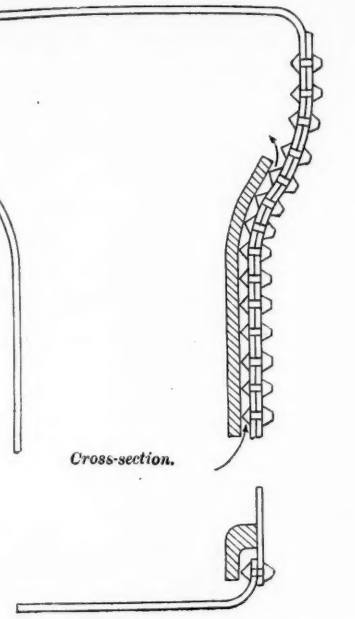
The grade crossing commission appointed by the Supreme Court Oct. 6, 1890, has filed its report. Grafton street crosses the main tracks of the Boston & Albany, Norwich & Worcester and Providence & Worcester railroads, just outside the Union Station at the west end. It is one of the worst crossings in the city. The commission was appointed on the petition of the mayor and aldermen of Worcester. It was essential that the grade of the railroad tracks be changed, but this would involve expensive changes in the Union Station, which the Boston & Albany would not consent to. The city thereupon sought to withdraw its petition and stop proceedings, but to this the commissioners would not consent, claiming that they had been duly appointed by the court to report the best scheme practicable for abolishing the crossing. The city took no further part in the hearings, but the commissioners went on and prepared a plan which was approved by the Boston & Albany.

The New York & New England, lessee of the Norwich & Worcester, did not care to bear the expense of the abolition of the crossing, and so refused to consent to the necessary change of grade. This blocked proceedings. The last legislature, however, passed a bill transferring jurisdiction as to change of grades from railroad directors to the State Railroad Commissioners.

To this body the Superior Court commission submitted its plan, which is now presented. It provides that the tracks shall be raised 2 ft., and the street depressed 13½ ft. to go underneath them. There shall be but seven tracks over the street, instead of 11 as now, and they shall cross by an iron bridge 105 ft. wide. The central span is to be 32 ft. wide over the roadway, and shorter spans over the sidewalks. The distance between the abutments of the bridge shall be not less than 50 ft.

The Boston & Albany is to do the excavating and embanking within the locations of the railroad, and raise the railroad tracks and build the bridge and its abutments, foundation, posts or columns, and the city of Worcester is to do all the work outside the location of the railroad tracks, and construct the roadway and sidewalks, and all that pertains to the streets passing under the bridge.

The commissioners determine that 65 per cent. of the total actual cost of the alterations, including the expense of the hearings and the compensation of the commissioners, which amounts to $1,279.65, shall be paid by the roads in the following proportions: Boston & Albany, 69-105ths; Norwich & Worcester, 24-105ths; Providence & Worcester, 12-105ths; 69, 24 and 12 being the width in feet of location of the railroads' respective width upon the proposed bridge along the middle line of Grafton street, and 25 per cent. of the actual cost shall be paid by the state and the remaining 10 per cent. by the city of Worcester.



Cross-section.

Plan.

Davis' Seam Protector.

If this plan is adopted it will greatly increase the expense of getting rid of other crossings in the city, and possibly postpone the much desired work indefinitely. The adoption of the report by the court will certainly be vigorously opposed by the city, and if this does not avail the legislature will be asked for relief.

The city has a comprehensive plan for getting rid of all grade crossings which provides for extensive changes in the Union Station, but it keeps the streets above ground. This plan will, doubtless, be brought to the attention of the legislature. The Boston & Albany people oppose it, because it will be more expensive as regards their crossings, and they naturally have no interest in the crossings on the Boston & Maine and Fitchburg roads. [These enter the Union Station at the north side. The city desires to depress these lines, but to do so involves the depression of the Boston & Albany and southern lines at Grafton street, a change directly opposite to that now proposed, and much more costly].

Lake Superior Iron Ore Production.

In our issue of Jan. 27, page 69, we gave figures of shipments of iron ore from Lake Superior for various periods and credited these figure to the *Marine Review*. They should have been credited to the *Iron Trade Review*, of Cleveland, in which paper they were published Jan. 12, and from which they were copied by the journal from which we got them. The preparation of these figures involved a great deal of labor, particularly those for the year 1892, which were only secured by correspondence with the superintendents of the mines, and we are glad to place the credit for them where it belongs.

The Survey of St. Louis.

In describing, in our issue of last week, the very excellent results obtained in the recent survey of St. Louis, the following typographical errors occur: In the statement, "The average closure of triangles was 2 m. 7 s. with heliotropes, 4 m. 6s. with target, average 3 m. 7 s."; these values should read 2.7 s., 4.6 s. and 3.7 s. respectively. Also, further down, for ± 0.001' read ± 0.001 ft.

Coal Premiums in Practice.

Seven years ago we described the system of coal premiums then in practice on the Pennsylvania Railroad. The system is still kept up with little or no change, and we are pleased to be able to describe in some detail the system as now used on the Pennsylvania Lines west of Pittsburgh, and to show how much the premiums amount to in practice.

Whatever coal and wood is delivered to an engine is charged up by the keeper of the coal station on a blank of which the form is shown marked No. 1. Three coupons like that shown are attached to the stub and they are filled out and left with the station-keeper as receipts in case coal is taken at more than one point on the road. The stub is filled out by the station-keeper and forwarded to the clerk of the Road Foreman of Engines, who keeps the records. An account is opened by him with each engineer and fireman, a blank of the form shown by No. 2 being used. This includes the date, number of engine, the train numbers, the coal consumed and the car mileage.

For each train a limit is fixed every month by the Superintendent of Motive Power, which is based upon the previous coal consumption by locomotives on that train and considering the amount and number of the premiums earned or the excess of coal used for the train in previous months. For instance, the limit shown on form No. 2 is 5.5 lbs. per car mile for train No. 9, and 6 lbs. for train No. 22. There is also an engine allowance of 25 lbs. of coal per mile in addition to the allowance for the cars hauled. This is deducted from the total coal consumed before computing the coal premium. For example, on form No. 2 the total car mileage for train No. 9 is 16,724, which at 5.5 lbs. per mile gives 91,982 lbs. as the allowance for that train. The number of pounds actually consumed is 147,100, from which is to be deducted 25 lbs. per engine mile, in this case for 16 trips of 148 miles each, giving a total of 59,200 lbs. as the engine allowance. The net coal to be considered in computing premiums is therefore 87,900 lbs., and deducting this from the amount figured on the car mile allowance leaves 4,082 lbs. as the saving in coal for this engine and train.

FORM NO. 1.

Engine No .. Date,... 189

Engineer,..... .. ..

Fireman,.....

Am't Coal on Tank, charge.....

.....

.....

.....

.....

.....

Amt't Coal left on tank, Credit. ....

Wood...../8th Cords at .....

Train No ...From.....To .....

(*Coupon.*)

....189

Engine No....Train No....

....Station,

Coal.....Pds.

Wood,.....8th Cords.

Engineer..... .....

FORM NO. 2.

Record of Coal Consumed and Premiums Earned.

			Limit 5.50, Train No. 9.		Limit 6.00, Train No. 22.		Limit 5.50, Train No. 20.	
Engineman: Louis Bercott. Fireman: James Smith.	Date.	Eng. No.	Coal Consumed.	Car Mileage.	Coal Consumed.	Car Mileage	Coal Consumed.	Car Mileage.
NOTE.—Days 5 to 31 inclusive omitted to save space.—EDITOR.	1	114	9,600	1,184	.....	.....	.....	
	2	"	.....	.....	10,000	1,184	.....	
	3	"	9,600	1,036	.....	.....	.....	
	4	"	.....	.....	.....	.....	7,000	888
Totals.....	..	....	147,100	16,721	61,600	7,696	63,500	7,104
Average pounds of coal per car mile.	..	....	.....	5.25	.....	4.62	.....	4.77
Number of trips. ..	..	....	.....	16	.....	7	.....	8
Pounds of coal saved	..	....	.....	4,082	.....	10,476	.....	5,172

Total pounds of coal consumed, 272,200; total pounds of coal saved, 19,730; total number of trips, 31; premium earned by engineman, $3.15; premium earned by fireman, $3.15.

Calculation, Train No. 9.

16,724 car-miles, at 5.50 lbs. per mile.....		91,982 lbs.
Number of pounds actually consumed.....	147,100	
Less coal allowed for empty locomotive.....		
One trip, 148 miles, at 25 lbs.....3,700 lbs.		
Sixteen trips, at 3,700 lbs.....	59,200	
		87,900 "
Saving in coal.....		4,082 lbs.

The results are summed up on a series of blanks of the form shown by No. 3 both by train numbers and subdivisions, and finally by the character of trains, as through passenger, local freight, etc. Taking train No. 1 for example, the number of trips for each engineer on that train is given, the average coal which is used per mile, and the pounds of coal saved or used in excess of the limit. It will be seen that of the five men selected for illustration three effected a saving, and two used more than the allowance with this train. Similar variations are shown by the figures for train No. 3, which are also given. The results for each man are summed up as shown on the same form for subdivision D for through passenger and for through freight. In this case it will be seen that all the engineers in passenger service on that subdivision but one made some saving and that a number of those in through freight service exceeded the limit. The amount of the saving is figured on the actual cost of coal per ton, which averages on the lines considered about $1.10. Half of the saving goes to the company and the other half is equally divided between the engineers and firemen. A summary is given showing the proportion of engineers and firemen who earned premiums and the amount of these premiums for the month for which the data is taken. From this it appears that the total premiums earned by enginemen was $155.55 and by firemen $147.90. The largest premium earned was $12 70 and the smallest 10 cents.

FORM NO. 3.

Names.	No. trips.	Coal consumed, lbs. Per car mile.	Coal consumed, lbs. Total.	Coal saved, lbs.	Coal used in excess of limit, lbs.	Premium earned.
Sub Division "C."			*Through passenger.*			
	Train 1.		*Limit.* 5.0			
A	7	4 29	.....	3,780	.....	.....
B	15	4.52	.....	5,300	.....	.....
C	2	5.68	.....	.....	1,080	.....
D	1	3.80	.....	1,805	.....	.....
E	1	5.52	.....	.....	485	.....
	Train 3.		*Limit.* 3.5			
F	11	3.38	.....	1,555	.....	.....
G	5	3.10	.....	2,717	.....	.....
H	3	3.72	.....	.....	796	.....
I	1	2.07	.....	1,860	.....	.....
J	1	5.17	.....	.....	1,319	.....
Sub Division "D."			*Through passenger.*			
K	26	.....	166,900	4,196	.....	$0.65
L	31	.....	268,500	43,398	.....	6.95
M	13	.....	111,800	16,812	.....	2.70
N	29	.....	237,600	12,087	.....	1.90
O	36	.....	319,700	79,456	.....	12.70
P	24	.....	225,500	.....	2,316	.....
			Through freight.			
Q	24	2.49	328,375	.....	20,218	.....
R	15	2 16	209,300	.....	15,887	.....
S	15	1 67	185,000	25,430	.....	4.05
T	22	2 18	285,950	.....	9,304	.....
U	21	1.92	262,775	947	.....	.15

Summary.

Number of engineers running.....	116	
" " earning premiums.....	55	
Average premium by engineers running.....		1.34
" " " earning premiums.....		2.82
Largest " " " "		12.70
Smallest " " " "		.10
Total " " " "		155.55
Number firemen running.....	115	
" " earning premium.....	53	
Average premium by firemen running.....		1.28
" " " earning premium.....		2.79
Largest " " " "		10.55
Smallest " " " "		.10
Total " " " "		147.90

By this system the enginemen receive the benefit of any saving which may be accomplished, while the only result of exceeding the limit is the absence of the premium and a probable investigation by the Road Foreman of Engines as to the cause of the excess. As has been already stated the limit for each train is established on the basis of what has been previously done with that train, and in case it appears on the one hand that no premiums have been earned with a certain train or that the majority of the men have exceeded the limit the latter will be increased, and on the other hand if large premiums have been uniformly earned it is taken as an indication that the allowance previously made has been excessive. These allowances for each month are made at the beginning of that month and no change is subsequently made by reason of great excess or large premiums earned.

In addition to the forms referred to the results are made out on a large sheet, which is posted in the roundhouse for the inspection of engineers and firemen. It is considered that the competition which naturally follows this publication is an important factor in the coal economy.

Judging from the reports of the month which have been taken for illustration it is possible for an engineman to increase his monthly wages by $10 or $12, while on the side of the company we have a total saving of over $300 for the month, from which is to be deducted any additional expense entailed by the use of the premium system. Inasmuch as the accounts are kept by the clerk of the Road Foreman of Engines it appears that the cost of maintaining a fuel premium system is but slight.

New Ferry House at San Francisco.

The plans for the new ferry house or "union depot," as it is called, which is to be built at the foot of Market street, San Francisco, have been approved by the Harbor Commissioners, and it is said that work will be begun soon. The plans were made by J. Page Brown, and the letting of contracts is in the hands of the Harbor Commissioners. As most of our readers know, the business of the Southern Pacific reaches San Francisco by means of a ferry from Oakland, and this ferry house, therefore, serves as the terminus of the transcontinental railroads. It is to stand practically on the site of the existing structure, and there will be three iron bridges for foot passengers, leading from Clay street, from Market street and from Mission street, into the second story of the building. These bridges are to obviate an inconvenience similar to that experienced in reaching the ferry terminals on West street in New York City.

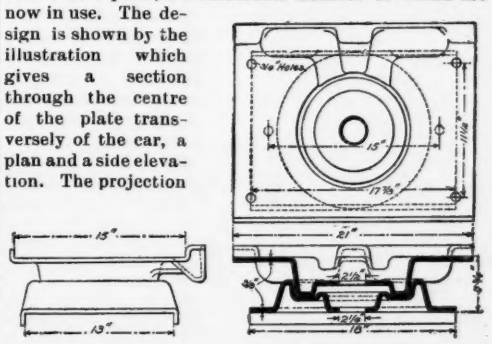
The new structure will be two stories in height, with the general cornice 50 ft. above the city base, and 840 ft. long by 150 deep. Forty-eight arched entrances will be set in the front, with three grand arched entrances extending through both stories, these latter breaking the long line of the building by projecting some 35 ft. in from the recently completed seawall, which will form the foundation for the west wall. The entire front is to be a continuous arcade, forming a covered passageway leading directly to the ticket offices, baggage rooms and ferry slips, of which latter there will be six, and assigned in the order named to the creek route Oakland boats, the South Pacific Coast, two to the Southern Pacific Company's main line, and one each to the San Francisco & North Pacific and the North Pacific Coast. Space is reserved for other boats and roads should occasion require, and also for extending the building if San Francisco ever outgrows this structure.

The second floor will afford many offices to rent after the Harbor Commissioners and their subordinate heads of departments have been accommodated. A corridor 50 ft. in width, with a glass roof, is to extend through the entire length of this floor, and leading from it will be the passageway for passengers desiring to take the upper decks of the ferry boats.

The tower will rise 200 ft. above the roof from the centre of the façade and 250 ft. from the ground. The new building will not rest on the sand-filled lots created by the construction of the seawall across the foot of Market street. The west front will have the seawall for its foundation and the 150 ft. of depth will extend into the bay, resting on piers of cement on groups of piles. For the tower, which will be principally constructed of iron and steel to render it earthquake proof, a special cement foundation will be laid. The exterior of the building is to be faced with Roman bricks and terra cotta, resting on a granite base, and the interior is to be faced with glazed enameled bricks. All the material, unless it is a minor part of the constructional ironwork, will be produced in San Francisco.

Pressed Steel Centre Plate for Freight Cars.

The Schoen Manufacturing Company, of Pittsburgh, has made for the Baltimore & Ohio Railroad a pressed steel centre plate, a considerable number of which are now in use. The design is shown by the illustration which gives a section through the centre of the plate transversely of the car, a plan and a side elevation. The projection



on the side of the upper plate is to take the thrust of the draft sills. The bearing surface of the bottom centre plate has an annular recess to retain the oil, with which the centre plates are lubricated. The centre of the bottom plate is pressed downward to make a bearing on the truck bolster. The wearing surfaces are large, and there is considerable saving in weight. This is a difficult plate to make, and it is a good example of what can be done with sheet steel by proper arrangement of dies and a careful selection of material.

Car Seat Coverings.

The Board of Public Health of the City of New York has issued an order that the upholstered seats, mattresses, and the like, in public buildings and hospitals shall be covered with leather or some substitute having similar characteristics. This is to better prevent the retention and spread of cholera germs. It has been suggested that similar precautions should be taken with regard to the seats in railroad cars, horse cars, steamships and other public conveyances, especially on the suburban and city lines,

New Boston & Albany Locomotives.

The Rhode Island Locomotive Works are building four eight-wheeled and two ten-wheeled locomotives for the Boston & Albany, the leading dimensions being as given below. The same builders are also making six heavy 19 in. by 24 in. switchers for the same road.

	Eight-wheelers.	Ten-wheelers.
Cylinders, diameter and stroke	19 in.×24 in.	20 in.×24 in.
Drivers, diameter	70 in.	70 in.
Fuel	Bituminous.	
Driving wheel base	7 ft 6 in.	14 ft. 9 in.
Truck base	5 ft. 9¾ in.	5 ft. 9¾ in.
Engine "	21 ft. 4⅞ in.	25 ft. 5⅞ in.
Engine and tender base	43 ft. ⅞ in.	48 ft. 8 in.
Weight on drivers about	72,000 lbs.	100,000 lbs.
" " truck "	39,000 lbs.	29,000 lbs.
" of engine in working order	111,000 lbs.	Do. 129,000 lbs.
Weight of tender in working order	71,500 lbs.	71.500 lbs.
Capacity of tank	3,600 gals.	3,600 gals.
BOILER.		
Material	Wellman steel.	
Sheets, thickness	9/16 in., ½in.	9/16 in., ½ in.
Rivets, diameter	⅞ in., 13/16 in.	⅞ in., 13/16 in.

All horizontal seams and junctions of waist and firebox double riveted; all longitudinal seams provided with lap welt with rivets alternating on both sides of main seam to protect calking edges. Top and sides of firebox all in one sheet. Boiler tested with 200 lbs. steam and 240 lbs. of hot water. To carry 180 lbs.

Waist, diam. at smokebox end	60 in.	60 in.
Extended wagon top, with extended smoke arch, one dome 30 in. diam. placed on wagon top.		
Tubes, No. and diam	250, 2 in.	250, 2 in.
" length	10 ft. 7 in.	13 ft. 8 in.
Firebox, length and width	96 in. × 33¼ in.	120 in. × 33¼ in.
Firebox, thickness side, back and crown	⅜ in.	⅜ in.
Firebox, thickness flue sheet	½ in.	½ in.
Water space, sides and back	3½ in.	3½ in.
" front	3½ in. to 4½ in.	3½ in. to 4½ in.
Staybolts, diam	1 in. and ⅞ in.	1 in. and ⅞ in.

" material, Taylor iron.
" centre to centre not over 4¼ in.
" above frames, drilled tell-tale.
Brick arch on water tubes.
Crown stays, radial, of Taylor iron.

MACHINERY.

Piston heads and followers, cast steel, with cast iron rings.		
Piston-rods, steel keyed to cross head, forced and riveted to piston.		
Guides	Cast iron.	
Crosshead	Cast steel.	
Valve stem, diam	1¾ in.	1¾ in.
Tires, driving, Midvale, 5¾ in. wide, 4 in. thick, with retaining rings.		
Plain tire, position and width,	front, 6¼ in.	first, 6¼ in.
Axles, hammered iron, journals, diam. length	8 in × 10 in.	8 in. × 8¾ in.
Boxes, steel, oiled from cab.		
Connecting rods, steel, with straps and keys.		
Coupling-rods, steel channeled, with solid ends.		
Rod and driving box bearings, Damascus bronze.		
Crank pins, Midvale special crank pin steel.		

ENGINE TRUCK.

Centre bearing, four-wheeled, rigid.	
Wheels, Snow spoked steel tired, 33 in. diam.	
Axles, hammered iron.	
" journals, diameter and length	5½ in. × 8 in.

TENDER.

Tank plates, thickness	¼ in.
" rivets, diameter and pitch	7/16 in. 1½ in.
Wheels, Snow, boltless plate	36 in. diam
Axles, best hammered iron.	
" journals, diameter and length	4½ in. × 8 in.

ACCESSORIES.

Driver brake	W. Y.	X. M.
Tender and train	Westinghouse.	Westinghouse.

Siebert light feed lubricator, U. S. metallic packing, Trojan coupler.
Martin heater, two 3-in. Consolidated muffled safety valves, Crosby chime whistle.

Wheel Flanges.*

Many often consider with astonishment the work which mechanics expect the wheel flange to perform, and in our entire equipment there is not a more simple or effectual design constructed for the importance of the work performed. On the strength of this small 1⅜ × 1¼ in. projection on the inside of steel tired and cast iron wheels depends the safety of thousands of trains, regardless of speed, regardless of curves and grades. Upon the strength of this flange to a great extent rests the practicability of maintaining trains on the metals.

When, however, we consider frogs, crossovers and guard rails, an entirely different aspect of the question presents itself, viz., the relation of the wheel flange as located on the axle to the gauge of the track. In these days of high speeds there is no more important point to look after than the gauge of flanges in their relation to the track.

The shape of the flanges has been exhaustively treated by both the Master Mechanics and the Master Car Builders' associations; and standards adopted by them, as shown in fig. 1, illustrate the contour lines for locomotive tire as adopted by the Master Mechanics Association and also the lines for cast iron wheels as adopted by the Master Car Builders. It is not our intention to discuss their merits or demerits; they have been adopted as standards, and have well stood the test of service.

This afternoon we propose to invite your attention chiefly to some points illustrating how a careless adherence to the above standards may bring about very serious and dangerous results when we consider the question of flange in its relation to wheel gauge and track gauge.

The standard distance between the backs of flanges of car wheels is 4 ft. 5⅝ in. as shown in fig. 2.

At the Nineteenth Annual Convention of the M. C. B. Association, held at Fortress Monroe in 1885, a committee recommended (see page 16 in the report of that meeting) that in fitting wheels on axles a variation be allowed of ⅛ in. each way from the standard distance of 4 ft. 5⅝ in. between flanges, making the maximum distance 4 ft. 5¾ in., and the minimum 4 ft. 5¼ in. This was adopted by the Association and is now its standard.

It was not, however, until the following year, 1886, that wheel gauge limits were introduced into the M. C. B. rules of interchange and the present limits adopted as shown in fig. 3.

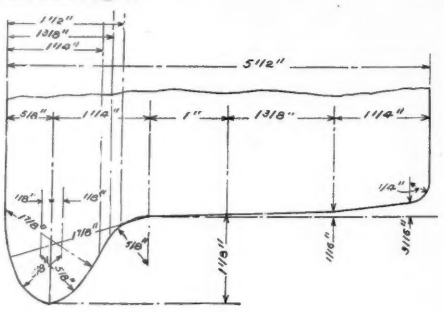


Fig. 1.

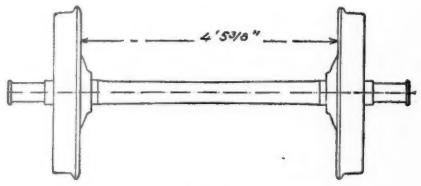


Fig. 2.

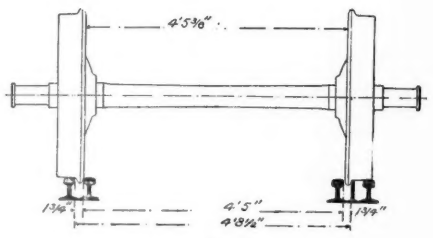
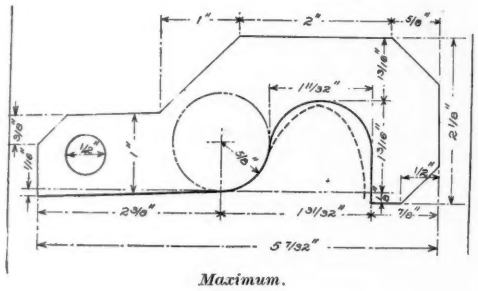
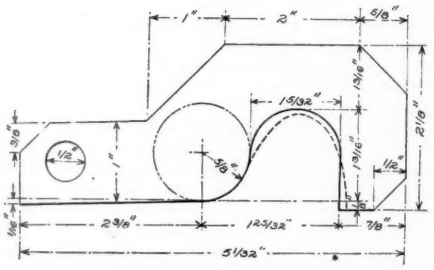


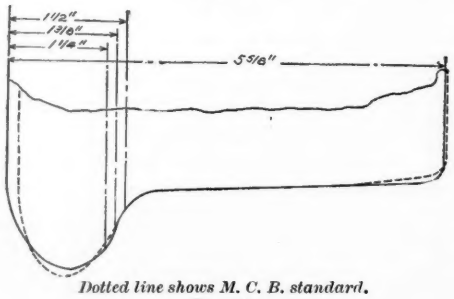
Fig. 4.



Maximum.
Fig. 7.



Minimum.
Fig. 8.



Dotted line shows M. C. B. standard.
Fig. 10.

This is rather remarkable when we consider the important part that the wheel gauge plays in the safety of running cars. Moreover, it was not a new idea; various lines had for years previous to this adopted limits for the distances between and over flanges. Perhaps the real reason for so long evading the question in the rules was the difficulty in reconciling the interests of the roads using a 4 ft. 8½ in. gauge and those using 4 ft. 9 in.; as the standard wheel gauge for 4 ft. 9 in. track and 4 ft. 8½ in. track must necessarily be different. How was it possible for those two interests to adopt the same limits? First, why is 4 ft. 5 in. the minimum limit? Simply because 4 ft. 5 in. is the distance between th guard rail and wing of frog, both for 4 ft. 8½ in. and 4 ft. 9 in. track. In the former case by having 1¾ in. space between gauge and guard rail, and also between the frog point and wing of frog, and in the latter case by having 2 in. at the same point (see figs. 4 and 5). Any wheels measuring less than 4 ft. 5 in. between flanges would have a tendency to either mount the guard rail, or by crowding its way through bring stresses likely to produce broken axles.

Let us next consider the reasons which make a maximum limit important.

Referring to column 6 in table we find:

Wheels	Maximum between flanges	4 ft. 5¾ in.
	Thickness of wheel flange (M. C. B. standard section)	1¼ in.
	Total	4 ft. 7 in.
Track 4' 8½"	Distance from guard rail to wing of frog	4 ft. 5 in.
	Distance between wing of frog and frog point	1¾ in.
	Total	4 ft. 6¾ in.
Difference		¼ inch.

This, you will observe, is not in keeping with good practice, for it allows a wheel mounted to the maximum limit to strike a frog point on 4 ft. 8½ in. track with a full ¼ in. of wheel, and clearly explains why frog points are so difficult to maintain even on 4 ft. 9 in. track. The maximum limit of 4 ft. 5½ in. as originally adopted in 1886 was more in keeping with the usually well considered actions of the Association. The change to 4 ft. 5¾ in. was made in 1887. Those allowing this to go through either did not understand the importance of the matter or were considering the interests of the roads using 4 ft. 8½ in. gauge. If we mount wheels beyond a 4 ft. 5½ in. limit, the wheel will come with full force against the frog point, not only ruining the point, but if the guard rail is loose and out of position, or if 4 ft. 5½ in. is exceeded, there is a strong probability of the wheels taking the wrong side of the frog point and ditching the train. If the real condition of the many derailments that occur at switches could be carefully looked into, we will venture to say there would be but little mystery surrounding the immediate cause. Unfortunately both track and wheels and axles are so broken up and distorted, and the importance of clearing away and opening up the line is so essential, that usually the real cause of such accidents remains shrouded in mystery.

How may this question be affected by a varying section of wheel? The M. C. B. Association has no maximum flange gauge, although they do have a minimum. In purchasing cast iron wheels we have at times found such variations in the thickness of flanges, even when the patterns are all identical, that we have found it necessary to adopt a maximum as well as a minimum flange gauge for new wheels. (figs. 7 and 8 represent these gauges.) Flanges that will not take the maximum gauge (fig. 7) are not accepted, and flanges that will take the minimum (fig. 8) are not accepted. The use of these gauges makes it practical in mounting wheels to use a wheel gauge of a form which at once controls the standard M. C. B., limit between flanges of 4 ft. 5¼ in., and, inasmuch as the flange contour of the wheel gauge corresponds with our maximum flange (fig. 7), it prevents the acceptance of any thick flanges should our foundry wheel inspectors accept wheels that they should not. Few railroads, we believe, use either maximum or minimum flange gauges in inspecting new wheels. At a foundry in this immediate neighborhood we recently found wheels being cast and accepted for service with a flange section that exceeds even the C., B. & Q. maximum limit. (Fig. 10 shows this section of flange.) For purposes of comparison we have shown in dotted lines the M. C. B. standard. Foundries do not always appreciate these differences in railroad practice.

There should be uniformity in the thickness of flanges with the prevailing practice of mounting wheels. The Master Car Builders' standard, as shown in fig. 1, is usually estimated as measuring 1¼ in. through the flange (some would call it 1⅜ in.); with the same method of reckoning, the flange in fig. 10 measures a strong 1⅜ in. (some would say 1½ in.). See the vertical dimension lines indicating the flange thickness at various points on the full size wheel sections, figs. 1 and 10. The M. C. B. wheel mounted to the maximum standard allowable between flanges measures as follows over flanges:

Distance between flanges	4 ft. 5¼ in.
Width of one flange	1¼ in.
Width of one flange	1¼ in.
Distance over flanges	4 ft. 8 in.

The above allows one-half inch play on a 4 ft. 8½ in. track. With the 1⅜ in. flange we would have:

Distance between flanges	4 ft. 5½ in.
Width of one flange	1⅜ in.
Width of one flange	1⅜ in.
Distance over flanges	4 ft. 8¼ in.

only allowing ¼ in. side play on a 4 ft. 8½ in. track or ⅛ on a side. If, however, we call the thickness of the flange 1½ in. in place of 1⅜ in., it is apparent that there would be no side play at all on a 4 ft. 8½ in. track.

How will such a flange act on the frog points of 4 ft. 8½ in. track?

Distance between wheel flanges	4 ft. 5¼ in.	
Width of flange	1⅜ in.	
		4 ft. 6⅝ in.
Guard rail and wing of frog	4 ft. 5 in.	
Wing of frog and frog point	1¾ in.	
		4 ft. 6¾ in.
Difference		⅛ in.

*A paper read before the Western Railway Club, by M. G. W. Rhodes, Supt. Motive Power of the Chicago, Burlington & Quincy R. R., Jan. 17, 1893.

TABLE *showing* DIMENSIONS *on* FIGURES *illustrating* MR. RHODES' PAPER *on* WHEEL FLANGES.

No. of figs.	2	3	4	5	6	11	12	13
	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft, in.
Distance between wheel flanges....	4 5⅜	4 5 4 5¾	4 5⅜	4 5⅜	4 5¾	4 5⅛	4 5¾	4 5⅜
Thickness of flange.....	.....	.....	.....	1¼	1¼	1⅜	1⅜	.....
Gauge of track	.....	.....	4 8½	4 9	4 8½	4 8½	4 8½	.....
Guard rail to wing of frog.....	.....	.....	4 5	4 5	4 5	4 5	4 5	4 5¾
Main rail to guard rail.....	.....	.....	1¾	2	1¾	1¾	1¾	2
Width of throat of frog.....	.....	.....	1¾	2	1¾	1¾	1¾	1¾
Width between flanges *plus* thickness of flange....	.....	.....	.....	4 6⅝	4 7	4 6⅞	4 7⅛	.....
Distance between guard-rail and wing *plus* width of throat of frog.	.....	.....	.....	4 7 clear.	4 6¾ foul.	4 6¾ foul.	4 6¾ foul.	foul.*
Difference.....	.....	.....	.....	⅜	¼	⅛	⅜	⅜

* Foul of wing of frog. Other clearances refer to point of frog.

The flange therefore would not clear the frog points by ⅛ in., or ¼ in. if the flange in question is rated as measuring 1⅛ in. Suppose, however, that no exception is taken to thick flanges, and that we attempt to mount them to the standard over flanges:

Standard distance between flanges.... ....4 ft. 5⅜ in.	
Standard thickness of flange.....	1¼ in.
Standard thickness of flange.....	1¼ in.
Present standard over flanges ....4 ft. 7⅜ in.	
Width of thick flange.....	1⅜ in.
Width of thick flange.....	1⅜ in
Necessitating a change in standard between flanges to..... .....4 " 5⅜ in.	
Present standard over flanges..... ....4 ft. 7⅜ in.	

This leaves but 4 ft. 5⅛ in. between flanges, whereas the standard minimum limit (page 106, 1890 report) is 4 ft. 5¼ in. If, however, we consider our thick flange as measuring 1⅛ in., we in the same manner will get for distance between flanges 4 ft. 4⅞ in. if we wish to preserve 4 ft. 7⅜ in. over flanges:

Width of flange.....	1⅛ in.
Width of flange..	1⅛ in.
Distance between flanges..... .... 4 ft.	4⅞ in.
Distance over flanges .... 4 ft.	7⅜ in.

What has been said is based on the assumption that wheels are accurately mounted within the M. C. B. standards. However, in practice, accuracy is not always followed; the interchange rules provide that cars must be accepted if the wheels do not measure more than 4 ft. 5¾ in. or less than 4 in. 5 in. between flanges. With these figures we get the results with thick flanges shown in column 12 of the accompanying table.

With flanges as thick as some foundries are casting them, it is possible to have them mounted within the gauge limits of the M. C. B. interchange rules and still not have them clear the frog points of 4 ft. 8½ in. track by ⅝ in. if we rate flanges at 1⅜ thick, and ½ in. if we call them 1½ in., and in the case of 4 ft. 9 in. track they would just clear the point with 1⅜ in. flange and strike it with ⅛ in. of wheel if rated as a 1⅜ in. flange.

The thickness of wheel flanges, therefore, plays an exceedingly important part in this question. With the present limits between flanges as prescribed by the interchange rules, and with no limits whatever for a maximum thickness of flange, a very dangerous and expensive element is quietly being introduced under the rolling stock throughout this country. It is our opinion that a maximum flange gauge should be considered at once by the Association, and, in adopting the same, full consideration should be given to the present wheel gauge limits. There is hardly a month passes on any of the through trunk lines that we do not hear of cars mysteriously leaving the rails. Is it to be wondered at with flanges and gauge limits as outlined in this paper?

In Mr. R. H. Soule's admirable collation of M. C. B. standards presented at the last M. C. B. Annual Convention he makes the rather surprising statement that the guard rail gauges of the Association are but little used by railroads. This is not as it should be. There is nothing more important on a railroad than track and wheel gauges, together with a thorough understanding of the relation one bears to the other. A practical illustration of failure in this respect will perhaps add force to this statement. On an important joint track in Chicago that is run over principally by passenger trains, a series of derailments took place last fall to through passenger trains, at a frog point located on a 13 deg. curve:

Nov. 22.—First derailment occurred.

Nov. 30.—Second derailment occurred.

Dec. 3.—Third derailment occurred.

As the speed was, slow nothing more serious than a blockade of tracks and delay of trains followed. Fully two weeks passed by before the cause of the derailment was discovered and remedied. An examination revealed the inexcusable state of affairs represented in column 13 of the table. The track foreman had evidenty been endeavoring to save the wear on his frog points without considering any other phase of the question. The distance between guard rail and wing of frog is actually 4 ft. 5¾ in.

Assuming that the wheels were gauged strictly to the M. C. B. standard of 4 ft. 5⅜ in. between flanges, they would not clear the wing of frog by ⅜ in. even on the supposition that the flanges conformed to the M. C. B. standard. If, however, the wheels were gauged only to the interchange rule minimum limit of 4 ft. 5 in., they could not clear such a condition of track by ¾ in. It seems almost incredible that such a condition of things could exist on a first-class railroad. The facts are nevertheless exactly as stated.

In conclusion, then, for purposes of greater safety to our present high speed passenger and freight trains we urge renewed interest in the matter of adherence to M. C. B. standards in wheel gauges, track gauges and wheel flanges. We also recommend for consideration the changing of the maximum limit between flanges from 4 ft. 5¾ in. to that first adopted in 1886, viz., 4 ft. 5½ in., and, further, that a maximum limit for thickness of wheel flanges be adopted. By far the most effectual way of bringing about uniformity and safety, however, would be to have a uniform track gauge. It is very unfortunate that this country should have two standards, 4 ft. 9 in. and 4 ft. 8½ in. So long as this exists and cars adapted to the narrower gauge are allowed to run over the wider gauge, and *vice versa*, each line in fixing its standards must consider the dual conditions that are sure to arise. The subject of uniform track gauge would seem to be one well worthy of consideration by the American Railway Association, which has already done much effectual work in bringing about uniformity, which can only be made effective by action of the managers of our different railroads.

Mr. BARR: Will worn flanges produce unpleasant results by increasing the play?

Mr. RHODES: The wear of the flange is in the throat of the wheel, while the danger is between the backs of the flanges, which wear little. Any wear of the flange, up to a certain point at the throat, will improve matters. It is only the new flange being too thick which causes danger to the point of the frog.

Mr. BARR: That is true if considered on the basis that the flange is always guided by the guard rail, but in reality that is not correct. Very frequently the wheel in passing will, instead of striking the guard rail, bear with the flange close against the main rail, and derailments have been caused by the flange being so worn that when running against the rail the opposite wheel did not clear the frog properly.

The flange passes through without touching the guard rail, and bearing heavily against the outside rail. The flange wears generally on one wheel only, the other wheel having a good flange, and that shows that from some cause or other—whether it is in the trucks or in the wheel is another question—but for some reason one wheel is always running against the rail, and the other away from it. The other wheel is polished on the outside, showing that it passes over frogs and through guard rails in that way. Wheels mounted closer than the standard cause considerable wear on the flange. A few months ago, right at the throat of the Western avenue yard, where there are crossings at a small angle, a pair of wheels were derailed on the point of one of these crossings because the head wheel hugged the track so closely that in going over the crossing the other wheel caught on the point of the crossing frog and derailed the train, and I have known several cases of the same kind. This should also have attention when considering the relation of flanges and rails.

Mr. RHODES: We have a minimum thickness of flange, and the object of the minimum is to condemn wheels before they reach the point where they are liable to climb the rail.

Mr. BARR: It is not a matter of climbing the rail with the wheel with the worn flange that I refer to as much as it is giving the play that will enable the other flange to get into a dangerous position on the crossing, which it certainly does. Mr. Rhodes' paper did not touch at all the relation of the flange to the wheel itself; neither did it touch on the wear of flanges. This thickening of the flange arises from a desire to get a larger mileage from the wheel before it is worn down to the limit which the gauge will condemn, and as such it is certainly very bad practice. Any one with a good hand hammer can knock a piece off the flange of any wheel running in the United States, and still those wheels carry our trains safely. The M. C. B. form of flange does not, by a very large percentage, give as good results in the matter of flange wear as can be obtained.

Mr. RHODES: I assumed that the M. C. B. and the M. M. standard sections were satisfactory, but if they are not satisfactory it is a legitimate thing to discuss. Those standards are not being lived up to closely enough. We have a minimum for flanges but we have no maximum, and by disregarding the maximum feature we are nullifying the use of our limit gauges. If there is good reason for a change, it should be discussed and eventually made, but we must be careful in making a change not to lose sight of our standard gauges, and we must not introduce a dangerous element.

Mr. BARR: I consider the flange shown by Mr. Rhodes in fig. 8 is bad from every point of view. It allows considerable more wear on the tread before it becomes too thin to pass the limit gauge, either wearing through or weakening the flange, and a wheel made with a thick flange like that will be more liable to break about the time it is worn to the limit that is called for in the M. C. B. rule of interchange than if originally made thinner. Another objection to the thick flange is that we are guided to a great extent by the distance between the flanges on the outside. Now, as Mr. Rhodes says, this kind of a wheel gives about ¼ in. play on the track. With only ¼ in. play on the track the wear on the rail is limited; and instead of an easy play of the wheels over the rail and a distribution of the wear, the tendency will be to wear a groove and the wheels will wear hollow in a short mileage.

We spend immense amounts of money every year for wheels, and everything reducing the life of the wheel ought to be guarded against, aside from considerations of safety. The M. C. B. ought to adopt a limit gauge of that kind.

Mr. CLOUD: This matter is interesting in connection with changes recently introduced in the shape of rail heads. The rounded junction between the side of head, which is vertical or nearly so, and the top line (the radius of the fillet or junction) is important, and recent changes making the side of the head vertical have an important influence on the desirable maximum and minimum limits of wheel gauge. If vertical sided rail heads become general it will be still more necessary to have thickness of the wheel flange fully guarded by M. C. B. standard, and perhaps some change made in the amount of variation allowable in measurements between flanges.

Mr. BARR: Does any one mounting wheels gauge them by the distance between the outside of the flanges?

Mr. RHODES: We mount all wheels with an inside limit gauge of 4 ft., 5¼ in. We put the wheels on to measure 4 ft. 5⅜ in., and our gauge allows ⅛ in. beyond that. The gauge is a very desirable one, because in wheels the gauge itself is a check on a big flange. We use a gauge in the throat of the wheel, but we have a projection on the inside as well, so we could not get them on too far; if they are too wide the gauge won't go over. New wheels with the flange as large as shown in fig. 10 are not safe, and yet that is the condition of things that we are in to-day.

WILLIAM FORSYTH: Everybody recognizes the evil of using too thick flanges. What is the reason for the M. C. B. limit for a thin flange? Is it a matter of strength or of track relations?

Mr. RHODES: It is for both. The vertical limit of height is to avoid the difficulty which Mr. Barr has alluded to. In going around a curve, of course, there is a tendency to grind against one flange. On some curves approaching important or dangerous places, such as bridges, although there is no frog point to draw the wheel away from, we nevertheless put a guard rail there to avoid the possibility of a sharp flange climbing the rail. The M. C. B. minimum limit of thickness of flange is intended to cover both the liability of the flange climbing and the liability of its getting too thin and more liable to break. The thickness of the flange may be just as dangerous, but this has escaped the attention of those getting up these standards.

The discussion of this subject will be continued at the next meeting of the club.

Association of Inventors and Manufacturers.

The second annual convention of the American Association of Inventors and Manufacturers was lately held in Washington, Dr. R. J. Gatling, the inventor of the Gatling gun, presiding, with a large number of members in attendance. Papers were read by members of the Association as follows: Mr. Arthur Stewart, of Baltimore, on the distinction between the patent system of the United States and those of other countries. Mr. Wm. C. Dodge, of Washington, on the benefits of the United States patent system. Mr. Oberlin Smith on a proposed patent office department of standards. Mr. Stephen H. Emmons on inaccuracies in the metric system of measurement. Mr. A. T. Andrews, of Connecticut, on the rights of inventors.

Among the business transacted was the adoption of resolutions asking of Congress such legislation as will perpetuate and perfect the American patent system, and the use of so much of the funds paid by the inventors as may be necessary to provide the Patent Office with the room, force, means and appliances necessary for the proper and prompt transaction of the business intrusted to it, and also to provide a special court for the trial of patent causes, to the end that speedy and uniform decisions may be had with a minimum of litigation, delay and expense.

A committee was appointed to select a committee of representative inventors and manufacturers from the different states to constitute an inventors' congress, to be held some time during the World's Fair. A committee on subjects and publications, consisting of James T. Dubois, Washington; Octave Chanute, Chicago, Ill.; Irving Elting, Poughkeepsie, N. Y.; Elihu Thompson, Lynn, Mass., and George N. Bierce, Dayton, O., was also appointed.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The Prussian railroad authorities have compared the results of the working of their system with those of some other European systems, based on reports for 1890, or the fiscal year nearest to it. Some of the most significant figures we give below, adding those for our own railroads:

	Traffic moved each way daily. Tons Pass	freight.	Receipts per mile. Per pass.	Per ton.	Profit on investment, p.c.
Prussia	427	988	1.143 cts.	1.288 cts.	5 39
All Germany	392	816	1.189 "	1.248 "	4.90
Austria-Hungary	201	571	1.343 "	1.645 "	5.36
France	304	490	1.363 "	1 610 "	3.75
Switzerland	302	262	1.639 "	2.433 "	3.92
United States	104	667	2.167 "	0.941 "	4.74

The density of traffic in the Prussian system was four times as great in passengers and nearly one-half greater in freight than ours, the population per mile of road being about 1,750 in Prussia and 382 in this country. The Prussian rates applied to our traffic would have yielded $101,554,000 *less* earnings from passeng ers, but $264,438,000 *more* earnings from freight—or, on the whole, 163 millions more than the actual American earnings, which is 73 millions more than the aggregate dividends of the American railroads in that year. We may not conclude from this, howe ver, that the American rates would have produced a smal ler income on the Prussian railroads. On the contrary, while our freight rates applied to the Prussian traffic would have *reduced* the Prussian freight earnings by about $33,000,000, our passenger rates would have *increased* the passenger earnings by about $51,000,000.

Deadwoods on Curves.

In another column will be found the discussion at the December meeting of the Western Railway Club on the use of deadwoods for freight cars, which was introduced by Mr. Rhodes. Rather recently some of the Eastern lines have ordered all deadwoods off from their freight cars, while some of the Western lines, notably the Chicago, Burlington & Quincy, are recommending their use. This difference of opinion among roads prominent in the Master Car Builders' Association gives the discussion of the subject a lively interest.

When cars having the vertical plane coupler are coupled together, either with one or with both knuckles open, the deadwoods are undoubtedly of value in reducing the damage to couplers and draft rigging. When the vertical plane couplers are in good condition there is no danger to trainmen, but when a link-and-pin coupling has to be made deadwoods are dangerous to the men. When cars are being switched in the yards and the couplers come together with the knuckles closed, the deadwoods are no protection, as then they are six inches farther apart than when the coupling is made. This six inches is just the thickness of two knuckles. Except the difficulty that sometimes exists when coupling cars with deadwoods on sharp curves, these are about all the facts pro and con that bear upon the question of using deadwoods.

What the difficulty of coupling on curves amounts to will appear from an examination of the table below. The Master Car Builders' standard position for deadwoods is 14 in. apart, spaced equally each side of the centre, the faces being 8 in. wide. The length of the deadwoods depends, of course, upon how they are placed with reference to the coupler and upon the construction of the end sills; but, assuming that the deadwoods are to be used for the protection of the draft springs, they should be so placed as to come together before the draft springs are closed up. The total movement of the two draft springs is about 4 in., and sufficient protection would be given to the draft rigging if the deadwoods were placed 3½ in. apart when the cars are coupled and the couplers are in a normal condition. Assuming 3½ in. as the proper distance between the deadwoods in this position, the table gives the distance between the deadwoods when they are used on different lengths of cars and on different degrees of curvature. From the clearance distance given in the table must be deducted the distance which the couplers are driven in out of their normal position after some service and when in the act of coupling. This driving in results from the permanent set of the draft springs and the shifting of the draw bar attachments. No doubt two couplers will couple generally when only sufficient force is applied to drive the knuckle back to a coupled position, but there are conditions when it requires considerable force to bring the couplers into position for a correct coupling, and these conditions principally are when cars of different lengths come together on a curve. This is fully explained by diagrams in the *Railroad Gazette*, Oct. 3, 1890. In such cases it frequently requires so much force to couple, not only to bring the cars into a reasonably good alignment, but to bring the cars central on the trucks when they have a swing motion, that the drawbar springs are compressed. If this compression is but little, then the coupling will be made; but if it amounts to nearly the full deflection of the draft springs, the couplers will not couple when deadwoods are used, for the reason that the deadwoods strike before the coupling is made. This brings about an uncertainty in coupling cars with deadwoods, and the trainmen never feel sure that a coupling is made until the engine starts the train

These troub les are all aggravated as the cars get old. This is one of the common difficulties with car details. A device may be operative and useful while new and in good condition, but may become very troublesome after service. It is easy to see from the table that new couplers on cars of equal lengths with stiff draft springs will couple readily on any reasonable curvature, but the clearance is very small and the coupling is uncertain when the cars and springs are old.

Length of car over all.	Distance between centres of trucks.	Distance from centre of truck to end of drawbar.	Normal distance between deadwoods on new cars.	Distance between faces of deadwoods on curves of various degrees. + indicates clearance. — indicates the amount of overlap.			Distance between faces of deadwoods on curves when draft springs deflect one inch each in coupling up.		
Ft.	Ft.	Ft.	In.	In.			In.		
				10°	20°	30°	10°	20°	30°
30	18	6	3 5/16	+2.72	+1.91	+1.16	+.72	— .09	— .84
34	22	6	3 5/16	+2.66	+1.73	+ .88	+.66	— .27	—1.12
38	26	6	3 5/16	+2.51	+1.42	+ .56	+.51	— .58	—1.44
46	30	8	3 5/16	+2.30	+1.13	— .01	+.30	— .87	—2.04
54	34	10	3 5/16	+2.09	+ .68	— .64	+.09	—1.32	—2 64

Railroad Matters in Massachusetts.

The Massachusetts Railroad Commission still maintains its place as the wisest body of the kind in the country. The retirement of the experienced chairman, Mr. Crocker, a year ago, and the death of Mr. Kingsley, left this year's work to be done by one old and two new members, the chairman, whose responsibilities are greatest, being one of the new ones; but the annual report, which is summarized on another page, shows that the man who wrote it is a diligent worker, and studious and painstaking in mastering the principles of railroad regulation, like his predecessors; and there are no signs that he is any less clear and sagacious in his grasp of the public questions affecting the railroads of his state. The report discusses the questions which are really important in railroad management, and in which the state is interested, and wastes no time on vague generalities or impracticable demands.

The one question on which the public may disagree with the attitude of the Board is that of passenger fares. The newspapers have demanded a reduction and have half-way threatened that if the roads did not accede to the demand for interchangeable mileage tickets at two cents a mile, the legislature would compel that rate on *all* tickets. This demand receives much more support from conservative people than such demands generally do, for the reason that the principal road of the state, the Boston & Albany, maintains local rates at 2¼ cents, while the New York, New Haven & Hartford charges only two cents. The Commission is non-committal on the mileage ticket question because the roads which resist the law are now before the courts, but the report congratulates the state on its low average passenger rate, so that it is to be assumed that the Commissioners do not think that a general reduction is due the people of the state. Under ordinary circumstances the Boston & Albany rate would probably be adjudged too high by any impartial tribunal, as the road has a large and profitable business and has paid good dividends for many years; but a company which is spending $1,000,000 for eliminating grade crossings on a line only 200 miles long may well claim that its profits ought not to be "regulated" down to such a fine point.

The facts about this grade-crossing matter constitute one of the most interesting features of the report. The Boston & Albany's 54-mile division, wholly free from these danger points, will doubtless be the longest stretch of equally safe track in the country. We cannot recall any such piece of road in any settled region. The problem in this case was made comparatively easy by the fact that there are no large towns on this 54-mile section. The building of a bridge at an old crossing in a large town always necessitates heavy land damages, and the large appropriation made by the State of Massachusetts to relieve the municipalities of a part of their burdens in this reform has thus far gone mostly to the smaller towns, for the reason that in the cities the adjustment of conflicting interests has caused long delays. The railroads are largely responsible for this delay in most cases, for the 65 per cent. of the total cost, which is the share that they generally have to pay, is, in a country district, wholly expended on their own premises, whereas in a city it may include some of the money paid to the abuttors on the streets. In one case the railroad manager feels that he is getting something out of the town (or state), and in the other he thinks he is paying out something for which he gets no return. An example of the complications incident to one of these problems in a large city may be seen in the Grafton street case at Worcester,* which has been pending more than two years, and is still unsettled.

The most spirited passage in the report before us is that concerning the need of a union passenger station on the north side of Boston. Besides the great need of a station proper, the public interest here demands that the Boston & Maine abolish the ancient grade crossing of two of its own main lines, the crossing of both of these with the Fitchburg road and the modification of the Charles River drawbridge difficulty. As the plans for the Boston & Maine for a partial solution of this problem (described in the *Railroad Gazette* of Nov. 11 and Jan. 13) seem to be of a temporary nature, we do not exactly understand the impatience of the Railroad Commissioners. These plans can, we should think, be carried out without expending much money that would be wasted if a more comprehensive scheme should be perfected in, say, three years; and it is highly important to make some sort of improvement at once. The present impediments ought not to be endured until a two-million-dollar improvement can be completed.

Our main reason, however, for mentioning this station question here is to call attention to a new demand that has been made in connection with it, to wit, to practically close the Charles River, except for vessels without masts, by building a high bridge without a draw. This point is not mentioned by the Commissioners, but a petition has been presented to the legislature and a hearing was held last Friday. The general question of the rights of railroad passengers in a hurry versus lumber schooners not in a hurry, which is of vital interest at New York and Chicago, comes up at Boston in a form which makes it in some respects more pressing than at either of the other places. The water traffic through the present draws is not so heavy as it would at first appear (as a good deal of the river front is lined with residences), and it is claimed that it is not increasing. Coal constitutes the greater part of it, and coal can be brought in vessels without high masts. An adequate station cannot get along with less than 10 or 12 tracks across the river, and it would require more than two, some claim four or five, draws if draws were put in. But the presence of the draws would spread the tracks far apart, impair the convenience of the station, and perhaps necessitate grade crossings of tracks, or the use of numerous crossovers by passenger trains, which would be about as bad. Without doubt the

* Described on another page.

people who use these railroads need a fixed bridge, and need it badly, but if we may judge by the indications elsewhere they will have very hard work getting it. The coal wharves and other interests opposed to them have no *great* rights, but the rights they do possess will doubtless be maintained with great pertinacity. But the Bostonians intend to appeal to Congress if they can get the desired support, and railroad men and engineers interested in similar questions elsewhere will do well to keep track of what is accomplished.

The Railroads of Russia.

The Russian railroad statistics for the year 1890 have been but recently issued from the office of the Minister of Transportation. In that year there were in operation in the empire (which does not include Finland nor the Trans-Caspian Railroad) 18,158 miles of railroad, equipped with 6,933 locomotives, 7,759 passenger cars, and 145,611 baggage and freight cars. The passenger cars have seats for 284,892 passengers, an average of 37 per car, and the average capacity of the freight cars was 22,400 lbs.

The same length of average American railroad in the same year had 3,596 locomotives, 3,111 passenger train cars, and 135,678 freight cars, or little more than half the number of locomotives, two fifths the passenger cars, and 7 per cent. fewer freight cars than the Russian railroads; but these units are not fairly comparable. The average capacity of our locomotives is probably far greater than that of the Russian engines; one of our passenger cars seats one-half more passengers, and the average capacity of our freight cars is probably 80 per cent. greater than that of Russian cars.

With the Russian road and equipment 82,664,000 train-miles were run, or an average equivalent to 6¼ trains each way daily over the entire system (against 6.17 in the United States). Of the Russian trains, 34 per cent. were passenger trains, 61 per cent. freight trains, 1 per cent. military trains, and 4 per cent. work trains.

The Russian passenger cars moved on the average 29,400 miles each, = 80½ miles per day; the freight cars 12,827 miles, = 35 miles per day. The average size of a train was 51.62 *car axles*. Substantially all freight cars have two axles, but the passenger cars average nearly three axles each. The freight trains averaged 65 axles, or 32½ cars, the passenger and mixed trains 36.42 axles, or more than 12 cars—probably because a considerable proportion were mixed trains, containing some freight cars.

The increase of the Russian railroad system in the ten years from 1881 to 1890 was only 3,984 miles—less than the additions made in the single state of Kansas in that time. With this increase of 28 per cent. in miles of railroad there was an increase of 19 per cent. in the stock of locomotives, of 10 per cent. in passenger cars and of 28 per cent. in freight cars.

The average distance run per locomotive in 1890 was 15,982 miles, 21.85 per cent. of which was in switching, etc., leaving 12,478 miles run with trains, against 24,083 in the United States. About 36 per cent. of the fuel used was wood, and the cost of fuel was 8.7 per cent. of the total expenses, averaging just about 6¾ cents per engine-mile. In 1888 the cost of fuel was 7½ cents per mile and 10.2 per cent of the total expenses. But in 1888 wood formed 42 per cent. of the total fuel used. In 1890 nearly one-sixth of the money spent for fuel was paid for petroleum, of which 296,903,700 lbs. were used, at an average cost of 20¾ cents per 100 lbs., which is about 58 cents per barrel, is of the same weight as American petroleum. We believe it is heavier, however, containing more paraffin and less naphtha. The steam-making capacity of 100 lbs. of petroleum is considered to be equal to that of 138 lbs. of English coal. At this rate the petroleum is equal to English coal at $3.37 per ton. The increase in the use of this fuel, chiefly on the roads which reach the Volga, by which the petroleum finds its principal outlet, has been so great as to excite apprehension, apparently; and the government has ordered that only a certain percentage of the locomotives may be adapted for burning petroleum.

The number of passengers carried by the Russian railroads in 1890 was 46,505,000, and the passenger mileage 3,133,090,000, the average journey being 67⅓ miles. The average proportion of seats occupied in the passenger cars was 36 per cent. The passenger traffic has increased nearly 35 per cent. since 1881 and 28 per cent. since 1885.

The tons of freight shipped in 1890 were 75,222,000, carried on the average 136¼ miles, making 10,250 *millions* of ton-miles, and occupying 49 per cent. of the capacity of the cars. The freight traffic has increased 64¼ per cent. since 1881 and 33 per cent. since 1885.

Reducing the traffic to the equivalent number of passengers and tons of freight carried over the whole mileage each way daily, the Russian compares as follows with our system:

Moved each way daily.	Russia.	United States.
Passengers	118	104
Tons freight	770	667

The Russian roads thus have a traffic about one-seventh heavier in each kind, and more nearly equal to ours than that of any other country. The fact that Russia has 5,000 inhabitants per mile of railroad and the United States only 382 should always be borne in mind, however.

There were killed on the Russian railroads in 1890 589 persons, while 1,347 were injured. Of the killed and injured 131 were passengers, 695 employés and 650 other persons. There is no separate statement of train accidents, but it is reported that no passenger was killed and but 1 injured by a collision or derailment during that year; that only 3 were injured by such accidents in 1889; while in 1888 32 were killed and 73 injured.

As for employés 2.54 were killed and 5.88 injured for every million of train-miles.

The number of employés on the 18,158 miles of Russian roads was 252,415, against 749,301 on the 156,404 miles reporting in this country in 1890. In Russia there were 13.9 men per mile of road, here 4.79. The work done per employé was 12,410 passenger-miles and 40,600 ton-miles in Russia; 15,800 passenger-miles and 106,360 ton-miles in the United States. Counting a passenger-mile equivalent to two ton-miles, which is not very far out of the way in this country, the American railroad man turns off rather more than twice as much work as the Russian. But, according to our notions, the Russian is quite as good as his pay, for the average wages per man for the year were only $156 there, and must be three times as great in this country. In Germany the number of employés per mile of road is but little less than in Russia, but the traffic is heavier; and the average yearly wage is $285 in Germany, or 80 per cent. more than in Russia.

The average cost per mile of the Russian railroads has been about $81,000, against $48,463 in this country. The government has guaranteed interest on 92 per cent. of all the capital invested in them. So far have the roads been from earning their interest that the advances made by the government on account of its guaranties amounted at the close of 1891 to the pretty sum of $515,000,000. The yearly guaranteed interest amounts now to a little more than $50,000,000.

The gross earning of the Russian system remained nearly stationary for the three years ending with 1890, when, however, they were 21 per cent. more than in 1885 and 42 per cent. more than in 1881. The working expenses were almost stationary from 1881 to 1887 inclusive, but have increased greatly since. The net earnings increased rapidly until 1888, and have decreased since. Per mile of road, however, the variations in gross earnings have not been great. In 1890 earnings and expenses per mile were, in Russia and this country:

	Gross earnings.	Expenses.	Net earnings.
Russia	$7,998	$4,830	$3,168
United States	6,725	4,425	2,300

The gross earnings in Russia were 19 per cent. greater than here, the working expenses 9 per cent., and the net earnings 37 per cent. greater. But the net earnings were but 3.91 per cent. on the cost of the Russian roads, while our net earnings were 4.74 per cent. on the cost of ours.

The passenger traffic yielded 18 per cent. of the earnings of the Russian railroads, the freight traffic 76 per cent. Here 25 per cent. of the earnings were from passenger and 68 per cent. from freight, to which we should add the 2 per cent. from express to compare fairly with the Russian system.

Finally, we note that in Russia the average receipt per passenger-mile was 0.79 cent and per ton-mile 1.013 cents, against 2.167 cents and 0 941 cent in this country. The Russian average rates are probably the lowest in Europe, both for passengers and freight; the average freight rate is but 7½ per cent. higher than ours, and the passenger rate is 63 per cent. lower. The Russian passenger traffic, however, chiefly third class, cannot properly be compared with ours. That a very low fare is a necessity there is shown by the fact that with this one of ⅓ cent per mile and a population per mile of road 14 times as large as ours, the travel per mile is but little greater than here. The average Russian pays but 28 cents per year for railroad fares, the average American $4.17.

Proposed Railroad Legislation.

One of the chief aims of the reforming legislator is novelty, and we find a brilliant example of a successful venture in this line in the very first bill we encounter this week. It is one presented in the lower house of the Alabama Legislature requiring railroad conductors to report all casualties and accidents to the nearest telegraph operator, "whose duty it will be to immediately telegraph said casualties to the nearest newspaper for publication." The penalty for failure is to be not less than $50 and not more than $500. In the same state Mr. Smaw has presented a bill empowering the Railroad Commission to fix rates for the railroads. The California bill to abolish the Railroad Commission was promptly adopted by the Assembly last week by a vote of 59 to 15. In Connecticut there is a proposition to establish a Board of Street Railway Commissioners, to consist of a lawyer, an electrical engineer and a practical business man. In Illinois it is proposed to modify employers' liability in cases of accidents to employés, and there is also a bill to regulate the hours of labor on railroads, similar to that heretofore proposed in Indiana. There is also under discussion a bill to regulate the management of railroads by prohibiting the presence in a board of directors of too many non-residents. In Kansas, Senator Jumper has introduced a freight rate bill which seems to have all the excellences of the freight rate laws recently passed in England. The author of the bill seems to have no fear but that he can apply this complicated English affair to Kansas conditions without much alteration.

The Minnesota Legislature has a bill to require blackboards at stations, on which passenger trains behind time shall be bulletined. Whether or not the penalty is to be $100 per train, to go to the fellow who discovers the failure, is not stated. The advocates of the Minnesota bill, heretofore reported, requiring the examination of locomotive engineers, say that there is a concerted movement to get such a bill passed in every state of the Union. There are a number of bills concerning elevators and tracks to them and one requiring the use of automatic brakes on all trains. The list of bills before the Railroad Committee contains several others, ending up with a "patent coupler bill," which the reporter thinks will "be killed the first time it is reached." We infer that he takes an equally cheerful view of some of the others. Senator Wood has a bill fixing maximum rates for freight and passengers and Senator Nelson one to place express companies under the control of the Railroad Commissioners, who may prescribe rates.

In Missouri it is proposed to place all public warehouses under the control of the Railroad Commissioners and to require railroad companies to exhibit in passenger cars the "names of all stations passed." Of course it is intended to do this automatically. What punishment is to be inflicted on the machine if it forgets to make the exhibition until after the station is passed, is not stated. Mr. Robyn has presented a bill requiring railroad companies to stop all trains at county seats. In Nebraska there are three maximum rate bills. In the New York Legislature last week a bill was presented similar to that heretofore reported in Ohio forbidding railroads to contract with insurance companies to pay personal injury claims. In North Carolina Mr. Spruill has introduced a bill changing the basis on which the Railroad Commissioners shall assess railroad property for taxation.

The present legislature in Ohio is said to be "the hardest on railroads in the history of the state," and a single issue of the Columbus papers contains proposed laws affecting railroads "too numerous to mention." The Senate Committee has recommended the passage of four; one requiring automatic couplers and air brakes, one, heretofore passed in the House, requiring a flagman to have had two years' experience as brakeman, and one which is described as "making a 4-cent freight rate." Whether this means 4 cents per 100 lbs. per mile or 4 cents per carload per 100 miles does not appear. We should not be surprised to hear that it was the latter. The Railroad Commissioner of Ohio wants authority over electric roads; two of these, one from Canton to Massillon, and one from Greenville to Newark, carry freight, mails and express matter, as well as passengers, but are subject to no direct supervision. Representative Pudney has introduced a bill to license the sale of liquors on dining cars. As the liquors are sold anyway, Mr. Pudney thinks the state might as well get some of the profit.

In Pennsylvania there is a bill to enforce the anti-discrimination clause of the constitution against railroads. This bill, we are told, "bobs up every session." In South Dakota it is proposed that the Secretary of State, Treasurer and Attorney General shall be ex-officio Railroad Commissioners. This bill has been passed by one house by a vote of 76 to 6. In Texas, Senator Bowser, not dismayed by the rebuff given by the United States court a few months ago, has introduced a bill enlarging the powers of the Railroad Commission, and several other members have done likewise. Another bill presented at Austin prohibits the watering of railroad stocks *and bonds*. The State of Washington "keeps up with the procession," and it is proposed to "regulate and define" railroad freight rates. There is nothing ambiguous about the first section of the law, which says that the rates on grain, flour, potatoes and hay shall be 75 per cent. of what they were on Jan. 3, and rates on other commodities must be no higher than they were on that date.

Train Accidents in 1892.

The *Railroad Gazette* record of train accidents has now been kept for 20 years, and the tables printed herewith show the principal totals of these records. As we have remarked in summarizing the figures for previous years, the facts given in the tables are so expressive in themselves that no special comment or explanation is needed to understand them.

As has frequently been explained, the most reliable basis on which comparisons of these records can be made is that of the number of persons killed, and especially of the number of passengers killed. Freight train accidents resulting in the death of employés may escape us; and the number of persons *injured* is a doubtful factor in a great majority of the accident reports, on account of the different views of different reporters as to how small an injury deserves to be counted. Referring then to the number of persons killed, it will be seen that the year 1892 has apparently been a little better than either of the two preceding. The train mileage has doubtless increased considerably over 1891, but the number killed is 15 per cent. less. The number of passengers killed has decreased in larger proportion (34 per cent.) than the number of employés killed. As usual, the number killed in accidents due to negligence in operating is larger than from all other causes combined.

In 1891 there were five accidents, in each of which more than ten persons were killed; in 1892 we have

TRAIN ACCIDENTS—THEIR NATURE AND CAUSES, FOR TWENTY YEARS.

	1892.	1891.	1890.	1889.	1888.	1887.	1886.	1885.	1884.	1883.	1878-82. †	1873-7 ‡
TRAIN MILEAGE in the U. S. in millions of train miles*	870.0	831.2	793.9	722.0	688.8	644.0	569.8	560.2	541 3	538.0	.....	.....
COLLISIONS:												
Rear	485	555	495	379	404	362	338	316	288	413	275	155
Butting	251	284	323	26	311	309	127	120	138	177	121	96
Crossing and miscellaneous	326	298	223	110	89	29	36	28	27	39	21	43
Total collisions	1,062	1,137	1,041	749	804	700	501	464	445	630	417	295
DERAILMENTS:												
Broken rail	63	53	38	32	61	50	45	102	60	84	48	71
Loose or spread rail	53	68	44	28	42	31	81	65	68	88	34	31
Broken bridge or trestle	50	42	38	42	40	39	20	32	34	35	27	24
Broken or defective switch	26	38	33	10	29	23	7	13	9	12	3	9
Broken or defective frog	11	11	12	7	16	7	20	11	11	7	2	5
Other defects of road	8	2	2	1	1	2	1	.....	.....	1	2	9
Total, defects of road	191	214	167	120	180	152	174	223	182	227	116	149
Broken wheel	46	39	37	28	48	27	37	41	22	40	28	22
Broken axle	56	66	59	48	44	4	62	48	30	60	35	32
Broken truck	28	38	25	20	27	8	14	18	12	24	11	10
Failure of coupling or drawbar	27	20	7	5	7	3	3	6	3	2	1	4
Fall of brakebeam	22	27	1	9	9	10	6	10	.....	.....	.....	3
Other defects of equipment	26	25	18	10	13	6	.....	.....	.....	3	3	4
Total, defects of equipment	206	215	158	120	148	100	122	123	67	129	79	76
Misplaced switch	98	78	54	54	70	49	68	55	82	89	77	76
Negligence of trackmen or bridgemen	5	16	8	10	3	4	4	4	2	9	5	9
Runaway engine or train	1	9	19	8	14	6	2	.....	3	1	2	2
Open draw	3	3	5	1	4	3	2	5	5	4	3	4
Other negligence	57	38	22	19	26	12	.....	.....	2	9	4	6
Total, negligence in operating	164	144	108	92	117	74	76	64	94	112	91	97
Animals on track	51	61	56	41	57	32	36	25	28	45	59	48
Snow or ice	7	6	6	5	22	6	27	30	7	13	13	2
Wash-out	19	19	18	2	19	11	23	22	25	25	21	28
Landslide	30	28	28	24	34	16	21	7	18	16	7	6
Accidental obstruction	29	20	28	8	20	31	17	17	42	53	32	38
Malicious obstruction	28	42	25	20	11	12	15	15	12	12	13	15
Switch or rail purposely misplaced	7	11	15	5	22	12	24	13	17	16	.....	.....
Other unforeseen obstructions	8	5	13	8	5	9	4	6	3	19	3	2
Total, unforeseen obstructions	179	192	194	131	193	129	167	135	152	199	128	158
Others	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	1	5
Unexplained	425	439	377	296	385	243	102	136	186	259	231	223
Total derailments	1,165	1,204	1,004	759	1,032	705	641	681	681	926	646	709
ACCIDENTS WITHOUT COLLISION OR DERAILMENT:												
Boiler explosions	19	19	21	13	15	14	19	11	16	13	14	10
Cylinder explosions	5	12	6	3	7	2	2	.....	2	5	1	3
Broken parallel or connecting rod	10	8	9	5	22	17	22	28	17	26	14	10
Cars burned while running	13	19	15	4	7	8	8	9	13	13	8	9
Various breakages of rolling stock	15	16	21	18	15	33	6	17	13	23	8	13
Other causes	38	29	29	18	33	12	12	7	4	4	1	6
Total without collision or derailment	100	103	101	61	99	86	69	72	65	84	46	51

RECAPITULATION.

Collisions	1,062	1,137	1,041	749	804	700	501	464	445	630	417	295
Derailments	1,165	1,204	1,004	759	1,032	705	641	681	681	926	646	709
Other accidents	100	103	101	61	99	86	69	72	65	84	46	61
Total	2,327	2,444	2,146	1,569	1,935	1,491	1,211	1,217	1,191	1,640	1,109	1,067

* Train mileage is taken from Poor's Manual, which gives *revenue* mileage only; that for 1892 is estimated.
† Average per year, for five years, 1878 to 1882 inclusive.
‡ Average per year, for five years, 1873 to 1877, inclusive.

CASUALTIES TO PASSENGERS AND EMPLOYES IN TRAIN ACCIDENTS IN 1892.

Tabulated According to Classes of Causes.

Month.	Defects of road.				Defects of Equipment.				Negligence in operating.				Unforeseen obstructions and maliciousness				Unexplained.				Total.			
	Pass.		Emp.		Pass.		Emp.		Pass.		Emp.		Pass.		Emp.		Pass.		Emp.		Pass.		Emp.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
January	4	90	8	24	0	10	2	6	3	18	25	66	0	0	6	7	1	29	5	8	8	147	46	111
February	0	18	6	6	0	2	8	12	1	16	20	32	1	3	2	1	0	1	1	4	2	40	37	55
March	0	38	1	10	0	23	8	23	1	29	26	42	0	4	2	12	0	1	0	6	1	95	37	93
April	1	6	1	3	0	0	6	12	0	13	8	39	3	5	6	15	0	6	5	38	4	24	30	107
May	10	36	7	17	1	0	4	5	9	52	19	48	0	18	5	35	0	5	1	4	20	111	36	109
June	0	34	4	9	0	0	4	1	20	98	12	79	0	10	13	43	1	10	11	11	21	152	44	143
July	0	0	0	3	0	0	5	7	5	35	6	54	0	3	14	5	0	17	4	8	5	55	29	77
August	4	18	3	8	0	16	3	9	3	40	20	58	1	12	6	24	0	13	3	5	8	99	35	104
September	3	19	5	4	0	7	5	4	15	65	49	93	0	21	8	8	3	7	3	1	21	119	68	110
October	1	24	6	3	0	0	2	3	10	53	25	59	0	1	6	6	0	1	8	12	11	79	47	83
November	0	14	0	5	1	11	11	9	10	47	30	73	0	11	1	10	0	11	2	6	11	92	44	103
December	0	31	0	11	0	13	3	2	1	53	31	75	0	0	3	11	3	16	0	10	4	113	37	109
Year	23	322	39	103	2	85	61	93	78	514	271	718	5	88	72	177	8	117	47	113	116	1,126	490	1,204
Year 1891	24	291	45	101	7	90	42	65	114	458	345	939	23	116	57	144	9	228	61	188	177	1,183	550	1,447
Year 1890	19	195	61	126	4	86	30	77	115	624	337	959	24	163	60	165	10	216	81	192	172	1,224	569	1,519
Year 1889	16	167	36	81	7	58	24	63	46	291	189	595	34	107	53	120	5	122	40	119	108	745	336	978
Year 1888	5	195	45	155	16	65	35	92	92	388	217	573	11	106	77	163	44	258	62	117	168	1,012	434	1,098
Year 1887	139	406	48	142	11	50	39	57	48	279	218	486	*	*	*	*	9	181	101	205	207	916	406	890

* Included in unexplained.

record of only one such, but if we could accurately estimate the seriousness of the dozen or two dozen worst accidents to passenger trains we should probably find that the year just closed was not so much better than 1891 as would seem to be indicated by the list of very bad accidents. The worst accident in 1892 was the rear collision at Harrisburg, Pa., June 25, in which 12 persons were killed. This was due mainly to the negligence of an engineman, but it was contributed to by a bad "failure of block working" and is by many regarded as due to that failure. The next in importance was the rear collision at West Cambridge, Mass., Sept. 10, where nine were killed. This was also caused by the recklessness of an engineman in running past a block signal. This signal was an automatic signal but it *was* a block signal. West Cambridge happens to be on the ten-mile section of road which was first equipped with track circuit signals (1880). At Golden, Ark., on May 20, nine persons were killed in a butting collision where a passenger train was running backward. On Sept. 21 the collision at Shreve, O., the derailment at Osage, Kan., and three smaller accidents resulted, altogether, in the death of 21 persons; and two other accidents in the same month killed 15 persons, though nearly all these were employés.

The year 1892 is the first in which we have had a considerable number of train accidents that were occasioned by the use of air brakes on freight trains. These accidents are generally quite costly, though they have not yet resulted in any large loss of life. As they are to a certain degree unpreventable this is to be regarded as a fortunate outcome.

Following is the classification of the casualties of 1892 according to the class of accidents in which they occurred, the records for the previous five years being shown for comparison.

Killed	Employés.	Passengers.	Other persons.	Total.
In collisions	252	77	33	362
In derailments	203	38	30	271
In other accidents	35	1	3	39
Total	490	116	66	672
Total 1891	550	177	63	790
Total 1890	569	172	65	806
Total 1889	336	108	48	492
Total 1888	434	168	65	667
Total 1887	406	207	43	656
Injured.	**Employès.**	**Passengers.**	**Other persons.**	**Total.**
In collisions	648	474	78	1,160
In derailments	518	629	34	1,181
In other accidents	39	25	2	66
Total	1,205	1,128	74	2,407
Total 1891	1,447	1,183	55	2,685
Total 1890	1,519	1,224	69	2,812
Total 1889	978	745	49	1,772
Total 1888	1,098	1,012	94	2,204
Total 1887	890	916	140	1,946

The number of persons killed and injured in train accidents during the past 11 years, as tabulated in our accounts, was as follows:

	Killed.	Injured.	Train mileage, millions.*	No. persons killed per million train miles.
1892	672	2,407	.....	.....
1891	790	2,685	831.2	0.950
1890	836	2,812	793.9	1.015
1889	492	1,772	622.0	0.681
1888	667	2,204	688.8	0.968
1887	656	1,946	644.0	1.018
1886	416	1,409	569.8	0.730
1885	307	1,530	560.2	0.548
1884	389	1,760	541.3	0.718
1883	473	1,910	538.0	0.879
1882	380	1,588	476.0	0.798

* Train mileage is taken from Poor's Manual, which gives revenue mileage only.

The more prominent causes of collisions are shown in the following table:

CAUSES OF COLLISIONS.

	1892.	1891.	1890.	1889.	1888.	1887.	1886.
Train breaking in two	101	96	65	82	67	55	81
Misplaced switch	90	78	90	59	61	44	41
Failure to give or to observe signals	140	153	82	58	62	53	30
Mistake in giving or understanding orders	78	88	73	46	40	42	27
Miscellaneous	201	259	243	150	130	87	43
Total explained	610	674	553	395	360	281	222
Unexplained	452	463	488	354	444	419	279
Total	1,062	1,137	1,041	749	804	700	501

Certain prominent characteristics of our records we presume to be well known; only the more important or peculiar accidents are made the subject of special inquiry; the other reports are taken chiefly from local newspapers; all these are carefully sifted and tabulated, though only those causing deaths or injuries are published in detail. We make no attempt to compare our records with those of the Interstate Commerce Commission, on account of the different methods of classifying. These explanations have been stated more fully in our annual editorials of former years.

We referred briefly to electric street car lines a year ago. These roads have rapidly increased and the business on them has come to be very large, and the question of safety to passengers is even more important than it was a year ago. In the month of June we noted the killing of 10 passengers on electric railroads; and in September 13 were reported as killed in one accident in St. Louis. In the month of October there were 13 serious accidents to electric cars, killing 8 persons. Nearly every other month of the year showed a few.

Is a bicycle baggage? is a question now being discussed. Of course it is not; but whether it is best for the railroads to receive and transport these impedimenta in the baggage cars or not is quite another question. In the first place it would not be at all difficult or costly to provide in every baggage car a rack proper for the reception of these vehicles, which are really troublesome to transport unless some provision has been made for them. If the convenience of excursionists were to be consulted, there can be no doubt that it would dictate the policy of facilitating rather than discouraging the bicyclists' tours in the vicinity of any railroad. Like the baby-carriage and the sporting dog, the wheel is an indispensable accompaniment of a numerous and very desirable class of passengers. It need not be classed as baggage, but it seems advisable to receive it, transport and deliver it with as little trouble to the passenger as if it were. There is still a considerable difference among railroads in their treatment of the sporting dog, and indeed as to their treatment of dogs in general. The reasonable and best practice would seem to be that the railroad company should arrange for the transportation and receive a fixed compensation in return, and that the price should be so small as not to be oppressive. Twenty five cents for each 100 miles or less is the rate on some roads. Upon others the transport of dogs is allowed to be a perquisite of the baggageman, and generally his rapacity does not stop short of $2; the result is a violent scene between the opposed interests and a just condemnation of the management of the railroad for its neglect to care for the needs of the public. It would be a pity to let anything like this extend to the dealings with bicyclers. During the excursion season, much is to be gained by making traveling a pleasure and the remembrance of a

comfortable trip, free from vexatious extortions, will have a bearing upon the mind at the purchase of the next ticket.

Mr. C. A. McAlpine, Superintendent of the Northern Division of the Old Colony, has issued a notice to his enginemen, calling their attention to rules 39 to 50, inclusive (the whistle rules), and stating that a more careful observance of them will be required. He says:

"Signals are given which in no way conform to the rules, and which are not only discordant and annoying, but in many cases actually dangerous through the uncertainty of their meaning. Unnecessary whistling must be avoided, but when signals are required they must be given in accordance with the rules and not to suit the individual fancy of each engineman. Each signal must be distinct and uniform, and sufficient space allowed between the sounds to prevent their running together at a distance."

Signals are given which "in no way conform to the rules" on a good many roads, and we should like to see this circular issued from certain superintendents' offices which we could name. But we hope Mr. McAlpine has laid in provisions and arranged for reinforcements for a long campaign, for those three words—"will be required,"—cannot be easily substantiated. The engineer who whistles X or B instead of "7" for highway crossings is generally a tough customer to deal with, however amiable his disposition, and those who are so fond of noise that it is pleasanter to them to call in flagmen at midnight, when people are asleep, than it would be at noon, are as numerous as applicants for brakemen's jobs and as persistent as Canada thistles. Unless Mr. McAlpine keeps after them with a hot poker he will find that new generations of fault finding residents will arise alongside his road faster than he can kill off the vicious whistlers—unless his men are much better than the general run.

As might have been expected, the Committee on Extensions of the Manhattan Elevated Company declines to recommend to its company to undertake to carry passengers from the Battery to Yonkers—say 16 miles—for five cents. At least the committee says that neither the Rapid Transit Commission nor the public could expect the Manhattan company to undertake this before being exactly apprised of the character and cost of structure to be required, the length of time to be given in which to construct it and the terms and conditions of the grant. Of course, as we have said before, the Manhattan company has the whip-hand in this matter and cannot be expected to make a heavy investment for a far-away profit until it can be more severely "twisted" than now seems possible; and who would? Meanwhile a very peculiar rapid transit bill has been introduced at Albany by one of the Assemblymen from New York City. This bill, as we understand, does away with the present rapid transit commission and substitutes a new board of five members, all of whom shall be appointed by the Mayor of the city of New York. The bill removes restrictions as to the amount of stock and bonds to be issued, leaving the company, which secures the franchise, free to create any amount of securities and sell them. The bill will also allow third tracks to be put on existing structures, extensions from the present northern termini to the northern limits of the city and spurs to the ferries; but will not permit any further occupation of the streets by elevated structures.

The new Railroad Commission of South Carolina, of which Mr. D. P. Duncan is Chairman, has just begun its exercise of authority to make joint rates for a railroad without consulting the railroad. A circular issued Jan. 21 by the Commission requires the Port Royal & Carolina Western to reduce rates on fertilizers in carload lots to what they were before this road passed out of the hands of the Richmond & Danville system and came into the charge of the Central of Georgia. Since this transfer the Central authorities demanded that the joint rates be raised on the basis of local rates, but were refused by the state authorities. Jan. 16 the change was made in spite of this refusal. The result is that the Columbia and Charleston phosphate companies have appealed to the Commission to adjust rates so as to enable them to compete with Savannah and Augusta in the same business. The contest is really between the phosphate producers of South Carolina and those of Georgia.

Mr. Higgins, of Delaware, has introduced into the United States Senate certain amendments to the Nicaragua Canal bill. These provide that bonds shall not be issued to the company until the President is satisfied that the canal can be completed and made adequate for navigation by vessels of the largest size, for a sum, including the amounts already expended, not to exceed the cash proceeds of $100,000,000 of bonds. In order that the President may be satisfied of this, it is provided that a board of five engineers (three of them to be army officers) shall be appointed to make an investigation and report.

The Panama Canal.

A Congressional committee has been appointed to investigate the operations of the Panama Canal people in the United States. The committee consists of the following members of the House: Fellows, New York; Geary, California; Patterson, Tennessee; Powers, Vermont; Storer, Ohio. Colonel Fellows says that the committee means business.

Westinghouse vs. New York Air Brake.

(*Continued from page* 77.)

MR. GEO. H. CHRISTY continued his address on behalf of the complainants:

When the application was originally filed on which Patent No. 376,837 was issued, the drawings contained a figure, 13, and the proper descriptive matter fully describing a modification of the invention, which, it was afterwards thought, ought to be patented separately. Patent 376,837, has, for its leading characteristic of novelty, *the utilization of auxiliary reservoir pressure in proper direction to impart opening movement to the emergency valve.* In the preferred form of construction illustrated in that patent, auxiliary reservoir pressure was shut off from the piston of the emergency valve during the time when its operation was *not* desired. A generic claim was admissible, covering such a structure, and its mode of operation, irrespective of the question whether auxiliary reservoir pressure was or was not always present, and claims to that effect were allowed. But on making separate and special claims for both forms of specific devices the Patent Office, while allowing *generic* claims sufficiently broad to cover any number of modifications, refused to allow *specific* claims for *more than one* such form. Hence fig. 13, and the descriptive matter were erased from that case, and were made the subject matter of another application filed Jan. 20, 1888. The defendants are charged with infringing claims 1 and 2 of this Patent, No. 448,827, issued March 24, 1891.

Auxiliary reservoir pressure, instead of being intermittently shut off from the emergency valve piston, *when inert*, as in 376,837, here continuously presses against one side of the emergency valve piston, but when its action is not desired, such pressure will be counterbalanced by train-pipe pressure on the other side of the emergency valve piston. On a great reduction of train-pipe pressure, auxiliary reservoir pressure will act on the emergency valve piston and open the emergency valve.

Defendants do not deny that their quick-action valve, both in its original form and as "modified," contains this feature, but contend that the novel construction which Westinghouse introduced to produce a quick-action brake consisted in providing two passages from the train pipe to the brake cylinder, with a valve in each, and providing for the control of both valves, by the manipulation of the engineer's valve, but by different pressures. Defendants admit Westinghouse was the first inventor of a construction possessing such a function, and that if he had made a broad claim the defendants could not have made any defense, but that his first patent contained limiting claims, and that this (No. 360,070) is the only one which can be broadly construed, or under which any claims of pioneership can be made; and consequently, all subsequent patents being for mere improvements on 360,070, must be narrowly construed; and, consequently, that defendants cannot be held as infringers.

The fallacy lies in the assumption that Mr. Westinghouse was entitled to only one patent with claims of a generic kind. No rule of law or equity so limits his rights. If Mr. Westinghouse had asked for it, he might have had a claim as broad, in terms, as defendants suggested, but he preferred to divide his invention into sections; the claims in each section being coextensive with the invention actually disclosed. To such a line of division there could be no possible legal objection.

In the second section, *the opening movement was imparted to the emergency valve*, not by the triple piston, as before, but *independently of such piston;* that is, *by auxiliary reservoir pressure.* During this second application, another division was made. While, in both modifications, auxiliary reservoir pressure moved the valve, in one this pressure was *shut off when its action was not desired*, and, in the other, it acted *at all times;* but, *while its action was not desired, it was counterbalanced.* Patent No. 448,827, by this division became *subordinate* to No. 376,837—is the pioneer patent as regards auxiliary reservoir pressure. Each patent fully advises the public as to what they are forbidden to use. And, at the end of its term, each patent shows just what can then be used, and gives full instructions for working that form of the invention described. As these are the sole purposes of a specification and claims, the patents in question fully comply with all legal requirements.

Claims of pioneership may be made under two or even three patents as well as under one, as the discovery of two passes over a mountain range. Rights under the patent law are coextensive with discovery set forth in the patent, whether the discovery be in one part, or in two, or in three parts.

Subdividing the first claim of Patent 448,827, it runs thus:

(1) In a fluid-pressure brake apparatus normally operated by a triple valve device, the combination, with such an apparatus,

(2) Of a valvular appliance having a casing provided with supply and discharge passages or connections, and

(3) A valve controlling an exhaust port from the supply passage to the discharge passage for quickly releasing pressure in the supply passage,

(4) Said valve being actuated to open the exhaust port by a greater than normal reduction of pressure in the supply passage,

(5) Independently of the action of the triple valve device, substantially as set forth.

Defendants' "original" and "modified" valves both infringe this claim in every particular. The devices interposed in the "modified" valve (Plate V.) between the emergency piston 13 and the emergency valve 20, are now dropped out, so that the one acts *directly on the other* instead of indirectly, as before, immediately on "a greater than normal reduction of pressure in the supply passage," which reduction at once operates on the under side of the piston 13, through the opening Y. These devides are identical with those of the patent, put together in a like co-operative relationship, and do exactly the same work in substantially the same way.

The first element of the second claim, "a triple-valve mechanism," is in both the defendants' valves. "A discharge valve controlling an exhaust port from a supply passage to a discharge passage for quickly releasing the pressure in the supply passage" is the valve 41, interposed between the supply passage 17 and the discharge passage 16. In both forms of defendants' device this dicharge valve is emergency valve 20. This valve, the claim then adds, is "actuated to open the exhaust port by fluid pressure in an auxiliary reservoir on reduction of pressure in the supply passage below the normal degree." In both forms of defendants' device this is exactly the operation intended and provided for. The emergency valve is actuated so as to open the exhaust port, which leads to the brake cylinder, by means of fluid pressure stored up in the auxiliary reservoir, which operates on the piston 13 in either valve, and this is done when, and only when, there is a reduction of pressure in the supply passage below the normal degree. And, lastly, this action takes place "in whatever position the slide valve of the triple valve mechanism may be brought, by such reduction" of the fluid pressure. Substantial identity of devices and of operation proves infringement.

Mr. Massey argued that the piston 13 of the valve shown in Plate V. of defendants' catalogue "is entirely unlike the piston or diaphragm 84 of fig. 1 of 448,827," and that in defendants' "modified" quick-action triple the emergency valve, being a poppet valve, will act "much quicker" than the slide valve of 448,827.

In appearance, the piston 13 of defendants' Plate V. does not very closely resemble the piston 84 of the patent. Pistons and diaphragms are mechanical equivalents, and in both complainant's and defendants' devices they operate by the same force, by the same movement and in the same way, to produce the same result. Hence, the difference "to the eye" is immaterial.

That a poppet valve will act "much quicker" than a slide valve, is, mechanically speaking, no difference at all, while the patent covers all valves adapted to do the work. Defendants were not the first to open a poppet or lift valve by the movement of a diaphragm or equivalent piston. This was done by Westinghouse in the quick-action patent 376,837, figs. 2 and 3, where it is marked 41; and a slide valve is shown to be interchangeable with it, as in fig. 8 of the same patent. Hence these valves are mechanical equivalents, and defendants got them and the rest of the invention from the patents sued on. Massey repeatedly stated that the poppet valve was old in the use referred to. Hence this difference cannot avail as a defense.

The frequency or infrequency with which mechanical devices may be called into active use has nothing whatever to do with the existence of a patentable combination made expressly with reference to such use whenever it may arise. What I have said of this emergency brake is equally true of all safety appliances. The fusible plug of a steam boiler, used as a protection against boiler explosions, cannot be fused so long as water and heat are properly regulated. It is inserted with reference to an emergency which may arise *at any time*, or may *never* arise. But the patentability of the combination with the boiler of a fusible plug would not, if it were new, be at all affected by any such consideration. The same is true of the combination which exists between a boiler and its safety valve.

Defendants state that the valve of patent No. 448,827, has never gone into public use. This is of no consequence, as a patentee is under no obligation to manufacture under his patent. The complainant, in recognition of the duty which morally rests upon all manufacturers of railway safety appliances, to furnish the public with *the very best*, is engaged in making and selling a standard equipment which it believes to be the best. The defendants by publicly advertising their apparatus as "interchangeable with the Westinghouse," have followed on the same lines, with slight variations in the direction of the less useful, but still practically successful, Westinghouse modifications. The present suit is for the purpose of reaching one of these modifications, and to allow defendants to take a patented modification of our own, and to use such modifications as a defense both against the original patent and also against the patent which covers the modification, is obviously unjust.

Defendants say that all the emergency apparatus of defendants' modified valve, except the check valve, is a copy of fig. 2 of patent 162,465.

If defendants, as they say, copied their emergency device from fig. 2 of the Ford, Westinghouse & Welsh patent, No. 162,465, they must have made the radical changes of construction and adaptation to give it, in its new location, its new function or capacity. In doing this, they made themselves infringers. And further, such new construction or reorganization of the valve of fig. 2, Patent 162,465, as would fit it for emergency brake service, would utterly destroy its use and efficiency under the conditions and for the purposes to which it was originally adapted.

Defendants allege:

1st. That the oath taken by Mr. Westinghouse which accompanied the application on which was granted the Patent No. 448,827 "was false."

2d. That after the application was rejected, Mr. Westinghouse acquiesced in the rejection; and, "under pretence of amendment, filed new drawings and additional descriptive matter, and thereby described" another invention.

3d. That Westinghouse had knowledge of the construction of defendants' triple and emergency apparatus, *before* the amendments above referred to were made.

Complainants deny all those defenses.

At the date of the filing of this divisional application, Jan. 19, 1888, Mr. Westinghouse made the usual oath as regards this invention, "that the same has not been patented to him, or to others with his knowledge or consent in any country." As a matter of fact a patent was subsequently granted to him in Great Britain, which bore date Jan. 6, 1888; one in France which was dated Dec. 3, 1887, and so on. Because these facts and dates did not appear in the oath which Mr. Westinghouse took on Jan. 19, 1888, the defendants say in their answer "that said oath was false." This oath, like all oaths, goes merely to the knowledge and belief of affiant at the time and there is nothing showing that Mr. Westinghouse had any knowledge in any respect at variance with the contents of his oath. Subsequently full and complete correction was made by the amendment which introduced into the specification a complete list of all foreign patents. (See Patent 448,827.) But the oath was, in all probability, *strictly true*, word for word. There was no foreign patent in existence until the actual and official issue by the foreign power; usually long after the filing of the application. In its legal effect it reverts to the date of filing, but it *does not become a patent* until the official *issue* of such certificate. The probability is that on the date of the oath, Jan. 19, 1888, no such certificate had been actually issued by any foreign power. The English patent, for instance, only becomes a patent on the filing of the complete specification and the affixing of the great seal. This usually takes place six months after the application, although the patent then takes date as of the date of application.

2. The next defense is, that the amendments as made were unauthorized.

Numerous cases show that the rule which governs such cases is that if the new claims which are inserted do not relate to the subject matter of the divisional case in which they are inserted, then they are void; but, if they do so relate to that subject matter, then their validity cannot be assailed on that ground. The opinion

of the Supreme Court, in which the amendments were held to have been authorized, reads as follows:

"The amendments made were not mere amplifications of what has been in the application before."

From which we infer that, where the amendments are "amplifications of what had been in the applicat on before," the patent is free from objection on that ground.

In *Brush Electric Co. vs. Julien Electric Co.*, tried in this Court, an amendment had been made a year after the filing of the original application. The word "perforations" had been inserted in a claim where the original specifications described cells or recesses or slots. The Court held that if "perforations" meant holes extending entirely *through* the plate, the amendment was inadmissible; but, construing it to "mean holes not passing entirely through but into the centre or interior"—the admendment was admissible. And, so construing the claim, the Court held it to be valid.

The Supreme Court in *Eames vs. Andrews* ruled:

"If the amended specification does not enlarge the scope of the patent by extending the claim so as to cover more than was embraced in the original, and thus cause the patent to include an invention not within the original, the rights of the public are not thereby narrowed, and the case is within the remedy intended by the statute. . . . Such is not the present case. Here the amended specification does not enlarge the scope of the original invention as described in the original specification. It simply, in this respect, supplies a deficiency, by describing with more particularity and exactness the means to be employed to produce the desired result."

In the present case a comparison, word for word, of the claims as amended shows that they are fairly within the scope of the original specification. The entire invention involved in this divisional patent was on record in the Patent Offie long before the defendants went into business at all.

3. Defendants assert that Westinghouse knew of the construction of defendants' triple and emergency apparatus *before* the amendments were made which resulted in the granting of the patent now in question.

But the evidence shows that the Westinghouse claims, one *verbatim*, and the other in substance, were on file long before the Massey valve had an existence.

MR. J. E. MAYNADIER and MR. CAUSTEN BROWNE then addressed the Court on behalf of the defendants, the following being a brief summary of their arguments:

The charges are that defendants have infringed the following patents: *a*, No. 172,064 (old triple valve with graduating stem); *b*, 222,803 (old Westinghouse engineer's valve with screw); *c*, 376,837 (second Westinghouse quick action triple, the valve now in general use): *d*, 393,784 (the Park patent quick-action valve) and *e*, 448,827 (the third Westinghouse quick action triple).*

* The other patents not alleged to be infringed but often referred to in the suit include 162,465, the Ford, Westinghouse & Welsh appliance for permitting the escape of air in the train pipe to facilitate the release of the old straight air brake. This, like 393,784 and 448,827, has never been brought into actual service. Patent 220,556 is the triple valve without graduating stem, and 360,070 is the first Westinghouse quick-action valve used at the 1887 Burlington trials, but superseded by 376,837.—*Editor Railroad Gazette.*

The defense is, as regards *a*, non-infringement; *b*, non-infringement; *c*, non infringement as to claims 1, 2 and 3, and lack of invention as to claim 6; *d*, non-infringement; *e*, the first and second claims are void in view of patents 162,465 and 360,070.

The combinations of devices in patents 360,070, 376,837, and 393,784 "are designed to accomplish one general object," and are three ways of embodying the same main invention, the combination of (1) train-pipe, (2) brake cylinder, (3) reservoir, (4) triple valve, (5) emergency valve.

As 360,070 and 376,837 are prior to 393,784, it is obvious that 393,784 must be limited to the third way; so that the question is *not* have the defendants made a structure embodying the main invention described in each one of the three patents? but have they embodied that invention in substantially the same way as the third way described in patent 393,784.

The third way, 393,784, is to actuate the triple valve and an additional or supplemental valve by the triple valve piston, which is always exposed to reservoir pressure on one side and train pipe pressure on the other side, and which, when moved by a slight reduction of pressure in the train pipe, will actuate the triple valve for service stops, but when moved by a sharp reduction of pressure in the train pipe will actuate both the triple valve and supplemental valve. The invention of 393,784 resides in the particular manner of utilizing this supplemental piston and cylinder.

The supplemental cylinder is always open on one side of the piston to the train pipe, in order that train pipe pressure acting on the supplemental piston may hold emergency valve closed; and the other side of this piston is open to the atmosphere. Consequently the supplemental valve must open exhaust from supplemental cylinder, when triple valve piston is not actuated by a sharp reduction of pressure in the train pipe, and must close exhaust, when triple-valve piston is actuated by an emergency reduction of pressure in the train pipe; for train pipe-pressure then flows to the under side of supplemental piston, thereby equalizing the pressure on both sides of it, and leaving nothing to hold emergency valve on its seat.

Defendants' fourth way is to actuate the triple valve only, with the triple valve piston; and to actuate the emergency valve by a second piston, exposed to the same pressures as the triple valve piston, but much less sensitive; so that although both pistons are exposed on one side to reservoir pressure and on the other side to train-pipe pressure, yet a slight reduction of train-pipe-pressure wil l actuate the triple-valve piston,—while a sharp reduction of pressure in the train pipe is required to actuate the other. This second piston 13 (in defendant's catalogue), when moved by a sharp reduction of train-pipe pressure, opens supplemental valve 14, thereby opening port *K*, and allowing compressed air from the train pipe to fill the cylinder of piston 17, and force emergency valve 20 off its seat.

This fourth way, used by defendants, differs from the third way, of Patent 393,784, as much as that third way differs from the second way, of Patent 376,837, or from the first way, of Patent 360,070.

In the first, second and third ways the triple-valve piston must be moved by an emergency reduction in train-pipe pressure; but in defendants' way, the triple-valve piston has nothing resembling this emergency motion.

As regards the alleged infringement of the engineer's valve, 222,803, it is largely copied from Patent 129,015, but the piston stem and charging valve of 129,015 must always move together, while in 222,803 the charging valve is moved away from its seat by the stem, but toward its seat by a spring. The second claim of 222,803 is for the combination of 129,015, viz., the nut, the spring, the piston, the stem, and the charging valve when the stem and valve are not connected. The third claim is for the same combination, with the exhaust valve added. Neither of these combinations is in defendants' engineer's valve.

(1.) The invention of Patent 222,803 is a charging valve and a discharging valve, combined with a piston and a spring, so that when the engineer wishes to open the charging valve he moves the piston *by means of power applied through the spring*, and the charging valve is thereafter automatically closed when the train-pipe pressure reaches the desired point by the train-pipe pressure forcing the piston back against the force of the spring (all this being copied from 129,015); and also, so that when the engineer wishes to open the discharging valve he applies power to slacken the spring, and the discharging valve is then automatically opened by the train-pipe pressure, moving the piston against the force of the slackened spring, and stays open until the train-pipe pressure is reduced to the desired point, when the discharging valve is automatically closed by the spring moving the piston against the reduced force of the train-pipe pressure; and also, so that either valve can be opened positively in case it sticks on its seat and will not move, in case of the charging valve under the increased force of spring, and in case of the discharging valve when the force of the spring is reduced.

(2.) With defendants' engine valve the engineer can only open either valve positively; the valve he opens is then closed automatically by the difference of pressures in the train pipe and main reservoir. The engineer has nothing whatever to do with the spring; and a peculiar system of levers between the piston and spring is essential, so that the spring yields only when the difference between the air pressures on the opposite side of the piston is varied, but the spring is practically unaffected when the engineer moves the operating handle.

(3.) If the piston of defendants' engineer's valve were made fast, the apparatus would still be efficient, but after the engineer had moved the handle to reduce the pressure in the brake pipe he would be obliged to move that handle back to reseat the valve when the desired reduction of pressure in the brake pipe had taken place, and similarly as regards charging the train pipe.

But if the piston of 222,803 were made fast, the apparatus would be wholly inoperative.

(4.) If the spring of 222,803 were not under the control of the engineer, the apparatus would be inoperative.

But if the spring of defendants' engineer's valve were meddled with by the engineer, the apparatus would be seriously deranged.

The first claim of patent 376,837 includes (1) "a chamber or casing having direct connections to a brake cylinder and to a brake pipe respectively;" (2) "a valve controlling communication between said connections;" (3) "a piston independent of and unconnected with a triple-valve piston, and actuated by pressure from an auxiliary reservoir" to open the valve.

The combination of the five elements necessary to make a quick-action triple valve, viz.: (1) brake pipe, (2) valve cylinder, (3) reservoir, (4) triple valve, (5) emergency valve, is fully described in Westinghouse's prior patent, 360,070; which shows the combination of (1) "a chamber or casing having direct connections to a brake cylinder and to a brake pipe respectively;" (2) "a valve controlling communication between said connections;" and (3) "a piston . . . actuated by pressure" in "an auxiliary reservoir" to open the valve.

This combination of the five elements is also fully described and shown in patent 376,837, and in patent 448,827. But as patent 360,070 was issued March 29, 1887, and patent 376,887 was not applied for until Oct. 1, 1887, the latter must be subordinate to the former, which seems to be the bottom patent for the combination of elements essential in a quick action triple valve, therefore the strenuous efforts of complainants to crown patent 376,837 with the pioneer halo are futile.

The complainants are also hampered by their subsequent patent 448,827, showing a third embodiment of the invention. The invention in question is embodied in one way in patent 360,070, in a second way in patent 376,837, and in a third way in patent 448,827; while the defendants embody in it two different ways. Hence the complainants are compelled to construe the first, second and third claims of patent 376,837 narrowly enough not to cover the first way; and the defendants submit that these claims do not cover the way described in the first patent, nor the way described in the third patent, nor either of the ways used by the defendants. The only patent which could have been taken to cover all embodiments of the invention is 360,070; and patent 376,837 is limited to the second way, and does not cover either the third, fourth, or fifth ways.

In the first way the triple-valve piston stem is forced against the valve hard enough to open it; while in the second way the triple valve piston when moved by a sharp reduction of pressure in the train pipe opens the emergency valve by means of an additional piston, which (while it is said in claims 1 and 2 to be "independent of and unconnected with a triple-valve piston," and in claim 3 to operate "independently of the triple-valve piston") is wholly controlled by the triple-valve piston, for this supplemental piston is exposed on both sides to atmospheric pressure only, while the valves are off, but connected to the reservoir by a port closed by a valve, until the triple-valve piston is moved by an emergency reduction of pressure in the train pipe far enough to act mechanically on the valve and thereby open a port and thereby allow air-pressure from the reservoir to move the supplemental piston, which acts mechanically to open the emergency valve.

In the first way (patent 360,070), the triple-valve piston acts *directly* to open the emergency valve; but in the second way (patent 376,837), the triple-valve piston acts *indirectly* to open the emergency valve.

In the third way (patent 448,827), the triple-valve piston has nothing to do with the emergency valve.

In the fourth way (defendants' quick-action triple valve), the triple-valve piston has nothing to do with the emergency valve.

In the fifth way (defendant's modified quick-action triple valve), the triple valve piston has nothing to do with the emergency valve.

Had the state of the art admitted, patent 360,070 might have covered all these forms of the invention; for each form is an example of a quick-action triple valve, and each embodies the same broad invention; but this broad invention must be claimed, if at all, in the first patent, 360,070, and not in any subsequent patent.

Patent 376,837 is limited to those forms of quick-action triple valves in which the triple-valve piston acts *indirectly* to open the emergency valve; therefore, neither defendant's quick-action triple valve nor defendants' modified quick action triple valve infringes claims 1, 2, or 3 of patent 376,837, as the triple-valve piston has nothing whatever to do in either of these forms with the emergency valve.

Patents 360,070, 376,837 and 448,827 prevent complainants from construing claims 1, 2 and 3 of 376,837 broadly enough to cover either form of defendants' quick-action triple valve.

We contend:

1. Patent 360,070 fully describes all the substantial and material parts of the quick-action triple-valve.

2. Patent 376,837 describes nothing more than a modi fication of the invention described in 360,070, the triple-valve piston of 376,837 acts *indirectly* to open the emergency valve, while in 360,070 that triple-valve piston acts *directly* to open the emergency valve. All the elements in 360,070 are in 376,837, but the supplemental piston is added in 376,837.

In both the triple-valve piston is always exposed on one side to train-pipe pressure and on the other to reservoir pressure; in both a slight reduction of side train-pipe pressure causes the triple-valve piston to actuate the triple valve for a service stop. In both a sharp reduction of the train-pipe pressure causes the triple-valve piston to actuate the emergency valve for an emergency stop. The sole difference is that in 360,070 the triple-valve piston acts directly or mechanically to open the emergency valve, while in 376,837 the triple-valve piston acts mechanically to open the triple-slide valve, which admits air from the reservoir to move the emergency piston, which then acts directly to open the emergency valve.

3. In 448,827 and in both forms of defendants' quick-action triple valve the triple-valve piston is relieved from all duty whatsoever, except actuating the triple valve, and the duty of actuating the emergency valve is thrown upon a second piston, which is a duplicate of the triple-valve piston, as it is always exposed to reservoir pressure on one side and train-pipe pressure on the other side, although it has nothing whatever to do with the triple valve.

Were 360,070 not limited by the state of the act or its claims, all the quick-action triple valves considered would infringe it, and were 448,827 valid for what it claims, defendants' quick-action triple valve (patent 447,337) and defendants' modified quick-action triple valve would infringe it. But how can either infringe patent 376,837? And can the complainants be allowed to assert that defendants' valves infringe 376,837, in view of the fact that they have taken patent 360,070, showing one double-duty piston for both valves, and patent 448,827, showing one single-duty piston on one, and a second single-duty piston for the other, while patent 376,837 shows a double-duty piston and a double-duty triple valve which act on the emergency valve through an interposed piston?

If claims 1, 2 and 3 of patent 376,837 be read omitting the words "*is independent of and unconnected with a triple-valve piston and*" from claims 1 and 2, and the words "*independently of the triple-valve piston*" from claim 3, they will be made void by patent 360,070. Hence the true construction of the three claims depends upon the meaning of the words above quoted. In what sense may the emergency piston be fairly said to be *independent of and unconnected with the triple valve piston* in patent 376,837; and in what sense may the emergency piston be fairly called a piston *operating independently of the triple valve piston?*

The emergency piston depends wholly upon the outflow of compressed air from the reservoir; and in that sense operates independently of and without connection with the triple valve piston. But the required outflow of compressed air from the reservoir depends wholly upon the full movement of the triple valve and its piston, and in that sense the emergency piston is both dependent upon and connected with the triple valve piston.

These limiting words were used to distinguish the invention of patent 376,837 from the invention of 360,070, and the meaning of the limitation is that what is claimed is the addition of a piston *between* the emergency valve and the triple-valve piston; the interposed piston lay idle until set in motion by the triple-valve piston; but when so set in motion is wholly independent of and wholly unconnected with the triple-valve or its piston.

These claims were intended to be limited to that variation of 360,070 caused by adding a piston shielded from the reservoir pressure, and throwing the additional duty on the triple valve and its piston of permitting a sudden outflow of air from the reservoir to operate that additional piston. This is not found in either of defendants' Quick Action Triples.

Claim 6 of Patent 376,837 is void, because a division plate held between two castings is a mere convenience of construction without invention.

Claim 3 of Patent 172,064 is for a charging port through the triple valve piston partially closed by a stem, instead of a charging port in the side of the valve case, as in Westinghouse's prior patent 168,359. As defendants use the side port and do not use the through port and stem they do not infringe.

In answer to the question "Why did you adopt the leading and essential features of the quick-action automatic brake system?" Mr. Massey says: "As the West-"inghouse patents covering the automatic brake system "began to expire in 1888 and 1889, I devoted nearly the "whole of my energies to devising a competing system. "At the start I was well aware that in order to compete "successfully I must produce a quick-action automatic "brake system, which not only must be wholly free "from all unexpired patents, but must also be inter-"changeable with the Westinghouse systems then in "use.

"Owing to the fact that all controlling patents on the "automatic system expired before the close of 1890, and "to the further fact that the 'Quick-action Triple "Valve' was not broadly claimed, while it was fully "described in patent 360,070, I thought I had full right "to compete with the Westinghouse Air Brake Com-"pany in the manufacture of quick-action automatic "brake systems by adopting all features which were "public property, and adding thereto my own inven-"tions; and on taking legal advice I was informed that I "might copy with safety any mechanism shown but not "claimed in any patent, and also embody any invention "claimed in any expired patent."

Claims 1 and 2 of 448,827 are void, because:

I. They must be construed to cover (*a*) the mere transfer of the automatic relief valve of 162,465 from the direct system to the automatic system, which is a mere double use, and not an invention: (*b*) the mere substitution for the automatic relief valve shown in 360,070 of the automatic relief valve of 162,465, which is a mere substitution and not an invention.

II. There is no invention described in 448,827 in view of 162,465 and 360,070.

III. The alleged amendments of April 26, 1890, and all of later date are "enlargements" and not amendments.

IV. The claims were designedly made far too broad,

and must be construed to cover (*a*) the double use, and (*b*) a relief valve whether controlled by a piston or its equivalent, or controlled in any other way, known or unknown.

Any person of the humblest skill in the art will obtain from 162,465 and 360,070 full and clear information as to the double use and generic combination or main invention.

Mr. F. H. BETTS then commenced to sum up the case on behalf of the Westinghouse Brake Co. He called attention to the great importance of the invention of quick-acting brakes which would relieve brakemen of great peril. The President of the United States in his annual messages to Congress has three times called attention to this subject. The number of persons killed on railroads during the year ending June 30, 1890, was 2,451 and the number of injured 22,390. Freight brakes would soon greatly reduce a large portion of this loss of life, which was due to the use of antiquated appliances. Part of this loss of life was in coupling cars, 369 being killed and 7,860 injured. Nearly the whole of the rest of the loss of life was caused by absence of automatic freight brakes to which these patents refer. If this invention is that of Mr. Westinghouse it is so important that it deserves to be sustained, and I can satisfy the court that the underlying characteristics of this invention are undoubtedly his. Defendants do not even allege that they made this invention themselves, as they say it was first made public in Patent 360,070, and that Mr. Westinghouse has failed to claim there the gist of his invention; therefore, they can take advantage of the substance and essence of his invention. They also say they can take advantage of the Ford, Westinghouse & Welsh patent No. 162,475, and uniting this and 172,064 (a triple-valve patent) together they can obtain all the advantages of a quick-acting brake.

But 162,475 was still running when defendants made their infringements. Their position shows they are not inventors, but appropriators of other men's inventions. The automatic brake is really one machine from end to end of the train. Defendants have taken the engineer's valve, the graduating device, and the means of utilizing pressure in train pipe for quick action, or practically all there is.

What was the real invention that made automatic freight brakes a success? The Ford, Westinghouse & Welsh patent had been before the country since 1875, and the triple valve since 1872 and 1873. The defendants say that a combination of these two patents could be made by any mechanic of ordinary skill, and would make a quick-acting brake. But not even Massey or Westinghouse had seen this up to 1886. Westinghouse, therefore, at that time used only an ordinary triple valve, of which 50,000 were then used on freight trains.

The result of the Burlington trials of 1886 was nothing but failure, owing to shocks. Mr. Westinghouse constantly experimented to obviate this and make a brake which would work satifactorily and with sufficient rapidity on long freight trains, and the result was Patent 360,070. At the 1887 Burlington brake trials there were five competitors, Massey being among them. The committee who conducted these tests reported, however, "that the field was as wide open as ever, and that Westinghouse was making fresh trials with new valves." Consequently, Patent 360,070 had not solved the question, and in fact produced greater shocks than the ordinary triple valve. The condition of things appeared so hopeless that the committee evidently thought it impossible to make air do the work. George Westinghouse, however, still believed he could make a quick-acting brake that would work by air without electricity, and he did it with Patent No. 376,837, demonstrating this by running a train of 50 freight cars all over the United States, giving an exhibition of tests at every large railroad centre. The thing, therefore, that first achieved success is the apparatus in Patent 376,837.

In 1888 the committee reported that "there is now a brake in the market which can be relied on in any condition of railway service." Defendants' witness, Mr. Massey, admitted that this referred to patent No. 376,837. The defendants say that any skilled mechanic could combine the Ford, Westinghouse & Welsh valve, and the triple valve and make a quick-acting valve, but did anyone do it? The only man who did it was George Westinghouse and it was a flash of creative force that did it and made the apparatus a success. It was not obvious, because while the whole railway world were fully conscious for six months of the great necessity of an improvement on 360,070, the method of doing it occurred to one man only, and therefore he is entitled to the full credit of a pioneer inventor. The Ford, Westinghouse & Welsh valve was an automatic valve to release pressure, but such valves were as old as the steam engine. Massey admitted that this patent contained no hint that it could be used for quick action, though this could be done by properly proportioning it. To say that it facilitated the action of the brake when its only purpose was to quicken the release of a non-automatic brake was equivalent to saying that the speedy retreat of an army showed its splendid fighting qualities. The primary function of a brake was to go on, while this patent merely facilitated release. Patent 360,070 was granted in March, 1887, and patent 376,837 was applied in October, 1887. The problem was therefore before the world for seven months before Westinghouse had applied for the remedy. The difficulty with patent 360,070 was that there was only one piston to do the work—the triple valve piston. If a large hole had to be opened to let out the air, some time would be required, and this defect was disastrous in the trials of 1887. This was remedied by using auxiliary reservoir pressure to open the emergency valve, an essential feature. In the former patent 360,070 the triple piston had too much to do, and therefore opened the emergency valve too slowly. This was remedied in 376,837 by a separate valve operated by reservoir pressure, whether balanced by having pressure on both sides or having pressure on one side only while inert is a detail. The remedy was in actuating the emergency valve by a separate piston of its own, and this was evidently not obvious, because during six months no one could suggest any remedy. This final point, the operation of the emergency valve by a separate piston actuated by auxiliary reservoir pressure is covered by patent, and an inventor who has brought his invention into successful use, benefiting mankind, is entitled to a most favorable construction of his claims.

Defendants say the emergency valve according to the claim must be directly connected to the triple, but that is contrary to the claim. Whatever indirect connection there is, they are separate as claimed. Defendants say claim is restricted to an emergency valve shielded from reservoir pressure, but the claim does not say so. Fig. 12 in patent granted 376,837 shows nothing shielding the emergency piston from pressure when inert. The passage through the stem of emergency piston will admit and exhaust air from the brake cylinder in ordinary work, but when fully applied it will move. Therefore this characteristic which defendants have asserted is an essential feature is not so, and patent 376,837 shows the emergency piston both shielded and not shielded from reservoir pressure.

Defendants argue, that our claims are incorrect in saying that the emergency valve is independent of the triple piston, as this is a feature that their construction alone possesses, but even defendants' quick-acting valve is dependent on the triple piston, for unless this closes the exhaust to the air, the brake would not go on, but any inter-dependence between triple and quick-acting is not important, the essential feature is the use of a separate piston for actuating the emergency valve.

What is pioneership but merit? A man who has conferred a great benefit to his country is entitled to a liberal construction of his claims as a reward for his success. The characteristic of the Park Patent 393,784 is the use of a separate piston for operating the emergency valve actuated by train pipe instead of auxiliary reservoir pressure. This feature is found in defendants' quick-acting triple, but divided into two halves presumably to evade patent.

Infringement is admitted of Mr. Westinghouse's latest quick-acting patent No. 448,827, where the emergency valve is operated by an abnormal reduction in train pipe pressure without moving the triple. Defendants say that these patents cover every possible way of working a quick-acting brake. But if true that he has invented all possible ways of doing this important thing, does that impair his claims as an inventor? On the contrary it confirms his title. Each of these methods was a direct increase to the knowledge of the world on the subject and therefore each were entitled to separate patents; first, the *direct* method, second, the *indirect*, and third, the *independent* method of moving the emergency valve.

The defendants say that while the construction may be as described, claim is not broad enough on 360,070, but a valve made under that patent was not successful, and needed the improvements which Westinghouse has subsequently patented. As regards the amendment of the patent, Justice Blatchford in Singer v. Grohsdorf says: "A specification is always open to amendment until the matter has been finally disposed of by granting the patent or otherwise." Westinghouse was quite within his rights in dividing and amending his claims because he was the first inventor.

Defendants neutralize auxiliary reservoir pressure on emergency piston when not in use by having the pressure on both sides, while Westinghouse shuts off the pressure when valve is inert. This is a mere difference of detail; in both cases the emergency valve is operated by auxiliary reservoir pressure, which is the claim in Westinghouse's patent.

Defendants argue that complainants' valves are not made "substantially as described," but that phase means to perform the same functions with regard to the work which they have to perform. The important thing is the action of the parts when in operation and not their state when inert as defendents argue.

The engineer's valve patent claims to be "operated by a handle, crank or lever," and the other claims are as follows in the two valves:

Complainants' Claims.	Defendants' Construction.
Single operating stem.	Ditto.
Charging valve operated by stem.	Ditto.
Escape valve which cannot be open when charging valve is open.	Ditto.
Interposed stem makes connection between charging and escape valve, with play so that one valve may be open without moving other.	Two forks instead of straight stem, but does that make any difference?
Independent connections to move charging and escape valves independently and successively.	Ditto.
Piston head will close charging valve as soon as pressure rises.	Ditto, but spring used plus reservoir pressure.

The only difference is that Westinghouse uses spring only as elastic force to close escape valve when pressure falls below a certain amount, while defendants use a spring plus reservoir pressure. This was insufficient to constitute a distinct invention.

Judgment was deferred.

The complainants' case was elucidated by numerous models and drawings of the various apparatus alleged to be infringed. The defendants did not produce any models. Several of the patents in the case have never been brought into practical use, including No. 162,465, the Ford, Westinghouse & Welsh appliance for facilitating the release of the old straight air brake, patents 360,070 and 448,827, the first and third Westinghouse Quick-Action valves and 393,704, the Park Quick-Action valve, owned by the W. A. B. Co. The quick-action valve now in general use in the Westinghouse brake is that referred to in the case as patent 376,837.

Electric Welding Tests.

In a recent paper before the American Society of Arts at the Massachusetts Institute of Technology, Boston, Mr. George D. Burton quotes from a report made by Mr. George L. Harvey, Mechanical Engineer, of Chicago, on some tests of electric welding apparatus. The following extracts from Mr. Harvey's reports are interesting, as they give account of power required to weld comparatively small pieces.

The tests were made to show the horse power required to heat given sizes of bars under various conditions, from which the cost of heating the test bars could be calculated to estimate the cost of heating different bars without an actual test. The power in the generating room was provided by a 60-H. P. motor, with an Emerson power scale so attached that the horse power delivered to the dynamo could be determined at any time. Allowance was made for friction, and power required to drive the generator, when the transformer was not at work.

No. of Pieces.	Kind of Metal.	Size of Each Piece Heated to a Forging Heat.	Cubic Inches.	Time Heating M. S.	Average H. P.	H. P. per cu. in. per minute.
2	Iron	1 × ½ in. × 4 ft. long	48	3.20	51.5	3.75
4	Iron	½ × ¼ in. × 3 ft. long	36	2.	58.8	3.27
4	Iron	1 × ½ in. × 3 ft. long	72	4.	52.7	2.93
2	Steel	1 × 1 in. × 3 ft. 1 in. long	74	5.	44.8	3.02
3	Steel	1 × 1 in. × 3 ft. long	108	8.	47.	3.48
3	Iron	1 × ½ in. × 3 ft. long	54	3.30	52.4	3.38
3	Iron	1 × ½ in. × 4 ft. long	72	4.	53.1	2.95
4	Iron	1 × ½ in. × 4 ft. long	96	6.	54.8	3.43
4	Steel	1 × ⅝ in. × 4 ft. long	72	4.	58.3	3.24
2	Iron	1 × ¾ in. × 4 ft. long	72	5.	49.9	3.44
4	Iron	1 × ⅜ in. × 3 ft. long	54	2.45	58.3	2.97
4	Iron	1 × ⅜ in. × 3 ft. long	54	2.40	57.	2.82
4	Iron	½ × ½ in. × 3½ ft. long	42	2.30	52.4	3.09
4	Iron	1 × ⅝ in. × 3½ ft. long	63	3.20	53.8	2 84
1	Hard Brass	1 × 1 in. × 2 ft. 8 in. long	32	3.30	34.2	3.74

Further tests show:

1. The horse power required to heat a cubic inch of material is independent of the length of bar—an unexpected result.

2. The horse power required to heat a bar decreases very rapidly, as the time of heating is shortened.

As the radiating surface remains constant, less heat will be lost by radiation, the quicker the piece is heated, and will, therefore, require a smaller "total heat or power" to bring a given bar to a white heat. This fact is of great practical value, as the rapidity of heating determines the value of the heating plant, for, if 10 minutes were required to heat a bar in a forge, and but one in this machine, you save ⅞ of the total time of not only your machines but your men.

In working pieces in a forge several reheatings are sometimes necessary—while, with work heated by electricity a less number of reheatings would be necessary. This saving of time, amounting to several per cent., must be added to the saving shown below.

3. Pieces protected from the air while heating require less heat than when exposed.

The electric heat, acting as it does from the inside and extending outward, heats a bar in a far superior manner to any external heating, even if the external heat is free from sulphur or dirt.

The central core, if required, can be heated to a liquid state, and retains heat longer than if it is heated by an open fire.

The electric method has the advantage that the heat can be applied while the bar is being forged.

The piece is always in sight, and loss of work by burning would be very rare, if not impossible.

Pieces can be heated without removal from the anvil at least more than a few inches.

The heat can be applied to just the part desired and no other, a great saving in power.

The loss of iron by oxidation is very slight and is given at about 2 65-100 per cent. when bar is heated in air, and 1 65-100 per cent. when heated under some protection.

A quick heat must cause less oxidation than a longer one.

The temperature can be regulated and maintained to any desired degree.

In tempering, bars can be brought up to a given predetermined heat by setting the regulator in a certain position, for the heating of a number of pieces as long as the power remains constant.

There are no working parts about the transformer which should not last for a long time without any repairs.

The heating of a piece is even through its entire length, which is very difficult with ordinary heating processes, and would for some work be very valuable.

Power tests taken in October by Mr. F. H. Crane, Mechanical Engineer of the Emerson Power Scale Co., with pieces of various lengths, are given below:

The percentage of power used in heating brass is much less than for heating iron or steel, but the time required to heat brass is longer than that required to heat iron or steel, so that the horse power necessary to heat a cubic inch of brass per minute figures about the same in the final result. This also applies in the heating of copper, and shows that the cost of heating of iron, brass, copper or steel, by electricity, is about the same.

TECHNICAL.

Manufacturing and Business.

The Alabama Iron & Steel Co., of Brierfield, Ala., has added machinery for manufacturing railroad spikes.

The Lodge & Davis Machine Tool Co. has received large orders from the Illinois Central railroad, and the Milwaukee Street Railway Co., for improved machine tools.

The Richmond Standard Spike & Iron Co. is putting in new machinery, at Iron Gate, W. Va.

The annual meeting of stockholders of the South Baltimore Car Works was held last week. The directors elected were: James Sloan, Jr., Wm. S. Rayner, John W. Hall, J. Swan Frick, Edward L. Bartlett, Clinton P. Paine and Ferdinand C. Latrobe. John B. McDonald was re-elected President, Charles T. Crane, Secretary and Treasurer, and Howard Carlton, General Manager.

Directors of the reorganized Pratt & Whitney Co., have been elected as follows: F. A. Pratt, Amos Whitney, R. F. Blodgett, Henry C. Robinson, Rowland Swift, John R. Redfield, Samuel E. Elmore and W. W. Hyde, of Hartford, and C. C. Cuyler and Mr. Kidder, of New York. F. A. Pratt, has been elected President of the company; Amos Whitney, Vice-President, and R. F. Blodgett, Secretary. No Treasurer has yet been chosen and John R. Redfield is acting as Treasurer.

The Bogue & Mills Manufacturing Company, of Chicago, announces that Mr. M. B. Mills has not been connected with the firm since early in December. The Bogue & Mills Manufacturing Co. is the sole manufacturer of the Mills system of railroad crossing gates.

The following companies have been incorporated in Illinois: The Union Railway Construction Co., of Chicago; capital stock, $10,000; incorporators, Oscar J. Petterson, Benjamin J. Richolson and George F. Wightman.

The Troy Valve Company, with a capital stock of $30,000, has been chartered by Ejek Bussey, C. A. McLeod and William Ross, of Troy, N. Y.

The Railway Torpedo Signal Co., of Sing Sing, N. Y., has been incorporated by John Gibney and Smith Lent, of Sing Sing, N. Y.

The Erie Car Works, Limited, at Erie, Pa., were attached last week by the Sheriff, on executions amounting to $102,000 in favor of Erie banks.

The Portland Company, Portland, Me., builders of locomotives, railroad cars and steamships, are putting in new machinery to increase the capacity of their freight car mill. Greenlee Bros. & Co., Chicago, have

just supplied them with their line of special wood-working machines.

New Stations and Shops.

The Berlin Iron Bridge Co., of East Berlin, Conn., has received the contract for rebuilding the tube mill of Curtis & Co., at Cohoes, N. Y., lately destroyed by fire. The new buildings will be fireproof, constructed entirely of iron and brick, no woodwork being used. The building will be 132 ft. wide by 131 ft. long, with a wing 20×74 ft.

The West Virginia Central & Pittsburgh Railroad is building a new brick station at Elkins, W. Va., in place of the one recently destroyed by fire. A new passenger station will be erected the coming summer.

The contract for building the Spokane shops of the Great Northern has been awarded to Messrs. McKenzie & Ashenfelter, of Spokane. The work is to be completed by June 15.

The Berlin Iron Bridge Co., of East Berlin, Conn., will build the new machine shop for S. F. Hodge & Co., Detroit, Mich. The building will be 150 ft. long and of the modern type, the central portion being 40 ft. in width, controlled by a travelling crane of 20 tons capacity, with a wing on each side 22 ft. in width, the wings being two stories high. When completed it will be one of the best machine shops in the Northwest.

Interlocking.

The Johnson Railroad Signal Co. has received an order to interlock the New Haven yard of the New York, New Haven & Hartford. This will require an 80-lever Johnson machine. The plan of signals is very complete and the work is to be carried out at once.

The Johnson Signal Co. is also just completing nine interlocking plants for the Chesapeake & Ohio and will erect one at the junction of the New York Central and the Boston & Albany at East Albany, N. Y.

The Railroad Commissioners of Illinois have ordered interlocking signals to be put in at the crossing of the Wabash with the Jacksonville Southeastern, three miles north of Litchfield, and also at a crossing of lines of the same companies south of Litchfield.

The New Orleans Bridge.

On Jan. 26 the President signed the bill giving a Congressional charter to the Southern Bridge & Railway Company of New Orleans to bridge the Mississippi at that point. The northern end of the bridge will be not more than five miles above the upper limit of the city, and may be within the city limits. The bridge will consist of three spans, the centre span to be 1,000 ft. in the clear and the flanking spans to be each 787 ft. The lower chord of the main span is to be straight and 85 ft. above extreme high water. The bridge must be begun within two years, and finished within five. Mr. E. L. Corthell, M. Am. Soc. C. E., is President of the Southern Bridge & Railway Co. and Chief Engineer of the bridge. This is the same project which was described in the *Railroad Gazette* of July 11, 1890. There is no truth in the story that a contract for building the bridge has been let.

Projectiles at Pittsburgh.

The *American Manufacturer* says of the Wheeler-Sterling armor-piercing projectiles, of which $312,000 worth have been contracted to the government, that their success is due to American pluck and perseverance. The two other firms in this country making armor-piercing projectiles bought the patents of Holtzer and Firming, paying in the neighborhood of $100,000 for each, but the Pittsburgh concern started on its own hook, and after many failures, all of which were instructive as well as costly, has at length made so much of a success that one of its 8-in. shells lately penetrated 14 in. of armor without injury to the point, "which was as sharp after impact as when it left the lathe." These shells have to be perfectly balanced to prevent wabbling, and the shoulder must fit the bore of the gun with a maximum deviation of not over .002 in. The finished weights of the shells are as follows:

Size, inches.....	4.	5.	6.	8.	10.	12.	13.
Weight, lbs.....	33	49	100	250	670	852	1,145

The English Channel Bridge.

A company asking Parliament to empower it "either alone, or jointly with any other companies, governments, associations, bodies or persons," to make surveys and soundings across the Straits of Dover, has deposited a bill in the Private Bill Office of the House of Parliament. The bill contains no clauses making a company to raise money, but as the company is to ascertain the practibility of making and maintaining a bridge or viaduct over the English Channel as a means of communication by steam locomotion or otherwise between England and France the general terms are probably thought sufficient to enable the work to be done by the railroad companies reaching Dover and Calais.

Notes on Isthmian Canals.

The Corinth Canal is at length approaching completion, and is to be opened the 23d of April next. The inauguration of the works took place March 27, 1882. The canal is a little over 3½ miles in length, 68 ft. wide on the bottom, 80 ft. at the water line, and 26 ft. deep. The original calculation put the excavation at about 14,000,000 cubic yards, and the first capital was 30,000,000 francs, to which 14,000,000 more had been added by July 31, 1889, when the works came to a standstill, on account of lack of funds. A new company was then formed to finish the canal, with a capital of 5,000,000 francs in shares and 23,333,500 francs in obligations, of which only 20,000,000 have been issued. This company has so far completed the work that the opening is announced as above. The contractors are under a fine of 100,000 francs a month for delay after the 10th of this month.

The period during which it is possible to save the Panama Canal concession is about expiring, and it is asserted that the Colombian government will declare the concession forfeited.

There is small hope of any legislation in favor of the the Nicaragua Canal project during this session of Congress. The railroad across the Isthmus of Tehuantepec not the Eads Ship Railway) will probably be completed next summer. After that the harbors at both ends of the line will have to be improved, so that it may be a year or even two years before it becomes a trade route. But then nothing except insufficient accommodations or other mismanagement can prevent this from becoming a strong competitor for California travel and freight, as a passenger from New York will save about one-third the time and from New Orleans about one-half the time necessary for a passage by Panama. Nor will the Nicaragua Canal be able to disregard the competition of a Tehuantepec railroad if it is conducted by Americans, at least in the matter of passengers and fast freights.

THE SCRAP HEAP.

Notes.

The total number of deaths from the oil explosion at Wann, up to Tuesday last, was given as 27.

The Illinois Central has applied to the United States Supreme Court for a re-hearing in the Lake Front case.

The employés of Wells, Fargo & Co.'s express have each received from the company a gift of a World's Fair souvenir coin.

On Jan. 26 a special train of the Union Pacific, consisting of five cars, ran from Denver to Ogden, 633 miles, in 20 hours and 25 minutes.

The passenger trains of the Chicago, St. Paul, Minneapolis & Omaha, between St. Paul and Sioux City, are now heated by steam from the locomotive.

The Grand Trunk has reduced its force of passenger brakemen by issuing a rule that all trains of less than eight cars must be run with only one brakeman.

During the third week in January, when it was very cold throughout the Middle States, the Philadelphia & Reading gave its freight trainmen pay for one-half day extra each day.

The number of persons killed on railroad premises in Buffalo in 1892 was 57, which was 16 less than in 1891. It is said that the more general enforcement of the rules requiring low speed at crossings is the principal cause of the decrease.

A Pittsburgh paper states that freight brakemen in that city used hand lamps for giving signals at noon on Jan. 27. The reporter evidently regards this as somewhat odd, though he says that it would be very odd anywhere else. The era of natural gas and clear skies in Pittburgh seems to be rapidly passing by.

The detectives of the Atchison, Topeka & Santa Fé have brought to light a long series of thefts from freight trains on the New Mexico Division of that road, and about 25 conductors and brakemen were arrested and imprisoned last week. It is said that as many more will be arrested. Five yard brakemen have been arrested at Buffalo, N. Y. for stealing from freight cars.

A Washington dispatch of Jan. 26 states that the House Committee on Post Offices has inserted in the appropriation bill an item of $196,314 for extra pay for fast mail on Southern roads. It is stated that this is to go to the line between Washington and New Orleans, via Atlanta. It appears that the Atlantic Coast Line has not received any extra compensation the past year.

The "Industrial Commissioner" of the Chicago, Milwaukee & St. Paul, Mr. Luis Jackson, has issued a circular describing the territory on the lines of that road where hard wood timber grows. The circular is issued for the purpose of attracting manufacturers. The Maine Central has created the new office of "Locator," the incumbent of which is to attract new industries to points on the line of the road.

The strikers at the Brooks Locomotive Works, Dunkirk, N. Y., were somewhat turbulent on Saturday last, and tried to keep a lot of new boiler makers from Philadelphia out of the shops. The sheriff on Saturday notified the military commander that he would probably want assistance from the militia; but it does not appear that there was serious ground for this action, and it was reported on Monday that the strikers had practically given up, about 400 of them having gone back to work.

Connellsville Coke.

The production for 1892 was 6,300,691 tons valued at $11,971,232. In 1890 it was 6,221,518, valued at $12,903,940. The average price, which was $2.08 for 1890, was $1.90 for 1891 and 1892. Of the 17,256 furnaces at Connellsville 13,808 were in operation in November, and 10,333 in August. There were no labor troubles during the year. Just as some of the New York papers were building up two great lake iron industries, one at the Ohio ports and the other at the ore shipping ports, based on coking raw coal at those ports, the *Connellsville Courier* says: "A feature of the year was the abandonment of the plan of shipping Connellsville coal to West Superior, Wis., and coking it there. Connellsville coke is once more being shipped direct to the Duluth furnaces."

Medals for Postal Clerks.

The Postmaster-General in accordance with his promise made last March, has presented a gold medal to the railroad postal clerk in each of the 11 divisions of the service, who, under rules prescribed by the General Superintendent and approved by the Second Assistant Postmaster General, made during that calendar year the best general record in his division. The medal winners are as follows: W. A. Manchester, Boston and Albany; Harry P. Swift, Greenport and New York; H. T. Gregory, Washington and Charleston; W. L. M. Austin, Charlotte and Atlanta; J. C. Edgerton, Grafton and Cincinnati; Peter Koerfer, Chicago and Burlington; George G. Bliss, Kansas City and Denver; Edward Burns, Redding and Sacramento; W. W. Allen, Jr. New York and Chicago; W. J. Woulfe, Minneapolis and Council Bluffs; W. O. Ware, St. Louis and Texarkana.

The North Pole at Paris.

Under the above head the *Revue Industrielle* publishes illustrations and a description of an artificial ice skating rink which was opened at Paris a short time ago, and which it is intended to keep frozen at all seasons of the year. The rink is a shallow basin, 40 × 18 meters, with a bottom of brick laid in cement. This is lined with sheet lead, and contains 4,000 meters of iron pipe disposed in the form of a flat coil, through which a refrigerating solution of chloride of calcium is circulated, this solution being cooled to a low temperature in a refrigerating plant. Arrangements have also been provided to cover the ice with a thin film of water after each day's use. The refrigerating machines employed are of the Fixary ammonia compression type, and steam is furnished by Babcock & Wilcox boilers. The rapidity of flow of the calcium-chloride solution through the freezing-coil can be varied to suit the requirements, depending upon the outside temperature. The rink has been open to the public since October.

Grade Crossings in Chicago.

A mass meeting was held lately in Englewood, Chicago, to do something about the grade crossings of streets and railroads. Resolutions were adopted looking to the appointment of a committee to get the necessary legislation to separate grades at crossings. Within a month there have been several very serious accidents. The custom of assigning superannuated and infirm persons to watch railroad crossings is exciting much indignant talk in Chicago. The crossing problem is a difficult one to solve and as the months go by it becomes more and more evident that the railroads incline more favorably toward elevated tracks instead of running the streets overhead. Viaducts when built for all street crossings and the consequent damages are paid will cost nearly as much as to elevate the tracks. Of course little can be done before the World's Fair to decrease the danger to the traveling public, and it may be expected that the heavy traffic of the coming summer will magnify the grade crossing evil and will bring about stringent temporary regulations by the city authorities.

Railroad Improvements at Elizabeth.

Work on the Pennsylvania track elevation at Elizabeth, N. J., which has been at a standstill for the last few weeks owing to the cold weather, has been resumed with great activity during the past week. The contracts providing for the extra work of depression of the Broad street-Morris avenue crossing, by the railroad companies, have been signed by all the parties and returned to the city, and the greater part of the work is being done at that point. The foundation of the east abutment of the embankment is completed up to the line of the neat work for the width of the two tracks which are to be elevated first. At the foundation for the west abutment of the North Broad street arches several springs of large size were met with which caused the undermining and caving in of the sewer at that point and drowned out the pumps. After freeing the excavation from water the damage was repaired and the foundation is about completed at that point. Ground has been broken for the foundation of the east abutment of the passenger arch on the line of Morris avenue, which is to be closed. The foundation of the west abutment of this arch is about ready for the topping off. As the work now under way cuts off the access to a part of this already dangerous crossing, the railroad companies have agreed with the city to limit the speed of all trains to not over 6 miles an hour at this point while the work is in progress.

LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works has received a contract from the Long Island road for building 18 passenger engines and 2 six-wheel switchers.

The Toledo, St. Louis & Kansas City has awarded a contract to the Rhode Island Locomotive Works for building 7 six-wheel switching engines.

CAR BUILDING.

The Pennsylvania company is in the market for 2,000 cars.

About 50 of the 300 cars being built by the Middletown Car Works for the Burton Stock Car Company have been completed and have been loaded with coal for western points.

President Isaac Witz, of the Basic City Car Works Co., has, it is reported, effected arrangements with the American Car Co., through President C. D. Pettis, of Chattanooga, Tenn., by which the plant at Basic, Va., will be started up at once with 200 men.

The shops of the Northern Pacific at Edison, near Tacoma, Wash., have an order for building 100 platform cars, to be 40 ft. long and of 75,000 lbs. capacity. The cars are intended especially for transporting bridge timber and building lumber. About 425 men are now employed at these shops.

BRIDGE BUILDING.

Albany, N. Y.—The following bridge bills have been introduced in the New York Legislature incorporating the Troy & Green Island Bridge Co., with a capital of $150,000 to bridge the Hudson River from Douw street, Troy, to a point opposite in the village of Green Island—the incorporators are: M. F. Collins, Thomas Fagan, Edward Murphy, D. J. Whelan, Charles Clementine, William Kemp, A. N. Brady, John J. White, John C. Fitzgerald, C. S. Burns and J. H. Gleason; appropriating $3,000 for a canal bridge at the Rathbun farm crossing Whitehall; appropriating $6,000 for a canal bridge at Ford street, Rochester, and appropriating $7,000, one-half to be paid by the city for a canal bridge at Clinton street, Syracuse.

Connellsville, Pa.—The Connellsville & New Haven Bridge Co. was chartered at Harrisburg, Pa., last week to construct a bridge over the Youghioghney River between Connellsville and New Haven.

Elm Grove, W. Va.—The piers and foundations for the new steel highway bridge over Big Wheeling Creek at this point have been completed. The King Iron Bridge Co. has the contract for the superstructure, and will commence its erection soon. The bridge is to be in use May 1. The cost is $10,000.

Fairfield, Pa.—The new iron bridge over Braymer Run at Fairfield, Pa., has been put in place.

Hamilton, Ont.—The Hamilton Bridge Co. has secured the contract for the erection of a $70,900 steel arch bridge for the Canadian Pacific, to be placed across the canyon in the Selkirk range of the Rocky Mountains. The bridge will be 465 ft. long, and 300 ft. above the bed of the canyon. The span of the arch is 336 ft. The work is to be completed by Aug. 15.

Harrisburg, Pa.—Charters were granted last week to the Belle Bridge Ferry Co., of Elizabeth, Allegheny County, Pa., and to the Connellsville & New Haven Bridge Co., of Connellsville.

Minneapolis, Minn.—The Minneapolis Bridge & Iron Co. has been chartered in Minnesota with a capital of $150,000. The incorporators are: C. P. Jones, A. Rinker, O. Huff, L. H. Johnson and Charles F. Hagin, of Minneapolis. The officers are: President, C. P. Jonas; Vice-President and General Manager, Andrew Rinker; Secretary, L. H. Johnson; Chief Engineer, Olaf Hoff. Mr. Rinkner explains the object of the incorporation to be the manufacture and erection of iron bridges.

A bill has been introduced in the Minnesota Legislature to authorize the Minneapolis City Council to issue bonds to build a bridge at the foot of Thirty-second avenue north. The bridge will cost about $125,000.

New Bedford, Mass.—A new bridge is projected between Westport Point and Horse Neck by Asa R. Howland.

New York City.—City Comptroller Myers has reported favorably on the plans for the bridge to be built across the Harlem River ship canal at Kingsbridge road at an expense of $400,000, and the Board of Estimate approved them this week. They will be sent to the Secretary of War for his approval. The plans provide for a bridge of steel 26 ft. above high-water mark, 50 ft. wide, and 430 ft. long.

Dr. Thomas Rainey, for the New York & Long Island Bridge Co., made application this week at a meeting of the Commissioners of the Sinking Fund for permission to locate piers and anchorages for a bridge structure over the East River from the foot of East Sixty-fourth street. One pier is to be built on the Manhattan Island shore and one on either side of Blackwell's Island, with two anchorages between.

North Yakima, Wash.—The contract for the bridges across the Yakima River, at North Yakima, Wash., has been let to the Pacific Bridge Company, of San Francisco, Cal.

Pend d'Oreille, Wash.—The contract for the construction of the Nelson & Fort Shepard railroad bridge across the Pond d'Oreille River in British Columbia has been awarded to the San Francisco Bridge Co. The bridge will be a cantilever 510 ft. in length, and will comprise three spans. Over 25 bridge companies bid for the work. The contract was awarded for about $40,000, while the bids of most of the companies ranged between $50,000 and $60,000.

Providence, R. I.—William D. Bullock has completed plans for a new iron bridge of three spans over the Woonasquatucket River at Francis street.

Rock Island, Wash.—The masonry substructure of the Great Northern bridge over the Columbia River at Rock Island, Wash., is completed. Work on the erection of the superstructure is now under way, and there will be little or no delay as all the material has been shipped by the manufacturers. The Edge Moor Bridge Works are the contractors for the superstructure.

St. Paul, Minn.—A large number of bridge bills have been introduced in the legislature this session, among them the following: To authorize Minneapolis to issue bonds to build a bridge over the Mississippi; to appropriate $500 to build a bridge in the town of Forest Lake, Washington County; to appropriate $500 to build a bridge over the Cannon River, in Rice County; to appropriate $2,000 for an iron bridge on Crow River, Carver County; to appropriate $800 for a bridge over Grindstone River, in Hinckley township, Pine County; to appropriate $1,200 to build a bridge over the Lac qui Parle River, in River Side town, in Lac qui Parle County; to appropriate $5,000 to aid in building bridges in Marshall County; to appropriate $1,200 to build bridges in Wabasha County.

Spokane, Wash.—The Western Bridge Co., of Spokane, has recently completed the construction of a bridge across the Palouse River in Whitman County, Wash., and across Hangman Creek near Latah. The bridge company is also building a freight house for the Northern Pacific at Spokane and has considerable other work. John M. Cunningham is Engineer of the firm.

Sutton, W. Va.—A new steel bridge is to be erected over Elk River, at Sutton (Braxton County), to take the place of a suspension bridge, condemned.

Tillamook County, Or.—Bids are called for by the Tillamook County Court for bridges across Wilson River; across the slough, on the north side of Wilson River, and across the Trask River.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Pullman's Palace Car Co., quarterly, $2 per share, payable Feb. 15.

Rome, Watertown & Ogdensburg, quarterly, 1¼ per cent., payable Feb. 15.

St. Paul & Duluth, semi-annual, 3½ per cent. on preferred stock, payable March 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Delaware, Lackawanna & Western, annual, New York City, Feb. 21.

Missouri Pacific, annual, New York City, March 14.

New York, Lackawanna & Western, annual, New York City, Feb. 21.

Peoria & Eastern, annual, Danville, Ill., Feb. 8.

Philadelphia & Erie, annual, Philadelphia, Pa., Feb. 13.

Pittsburgh, Cincinnati, Chicago & St. Louis, annual, Pittsburgh, Pa., April 11.

St. Louis, Iron Mountain & Southern, annual, New York City, March 14.

Texas, Sabine Valley & Northwestern, special, Longview, Tex., Feb. 13, to increase the capital stock.

Wheeling & Lake Erie, annual, Toledo, O., Feb. 14.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Freight Claim Association* will hold its semi-annual meeting in St. Louis, Mo., March 8, at the Southern Hotel.

The *New England Railroad Club* holds regular meetings at the United States Hotel, Beach street, Boston, Mass., on the second Wednesday of each alternate month, commencing January.

The *Western Railway Club* holds regular meetings on the third Thursday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at 7:30 p. m., at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Wesleyan Hall, Bromfield street, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds rugular meetings at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month. The annual meeting is held on the third Saturday in January.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jackson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Aesociation of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The *Association of Engineers of Virginia* holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

The *Engineers' and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

American Society of Civil Engineers.

A meeting was held Feb. 1, the first paper read being by Robert Cartwright, M. Am. Soc. C. E., on the "Construction of the Power-House of the Rochester Power Company, adjacent to Genesee Falls, Rochester, N. Y."

The Genesee River drains an area of about 2,500 square miles, and at times pours a flood over the Falls in the City of Rochester, with a volume 293 ft. wide, and 5 to 6 ft. deep; the perpendicular fall being 90 ft. By a series of dams the water is used four times before it reaches the level of Lake Ontario. The paper describes the construction of a power-house close to the Falls, where the great scour made it impracticable to use a timber coffer-dam. This scour was increased by a wing-dam above the Falls, which turned the water toward the side where the power-house was to be built. The rock at the site was undercut by the action of the water, and the first operation was to blast off the overhang to a batter of 1½ in 10. Operations were carried on day and night, from early in 1890 to November, 1891 (except in freezing weather), since which time the water power has been in use.

The plant consists of two double Leffel wheels, 26½ in. in diameter, each supplied by a 5-ft. flume under an effective head of 87 ft., with a volume of 6,250 cu. ft. of water per minute, and a development of 600 H. P. by each. The wheels are of phosphor bronze and tinned Otis steel buckets. The power is transmitted from a 5-ft. rope wheel to a 12-ft. rope wheel 90 ft. above, through sixteen 1¼ in. Manila ropes. The ropes are adjusted by a tightener wheel in an adjustable frame. Each wheel has its own flume and gate, and can be used independently. The ropes run at the very high speed of 7,540 ft. per minute, and no delay has occurred in over a year's use.

The rock at the top of the Falls, which is an easily disintegrated shale, overhangs some 20 ft. and the pool below is 40 to 50 ft. deep. The depth at the northwest corner was 10.7 ft. and 13 ft. to the northward, 22 ft. deep, giving a slope of 45 degrees. The river sometimes rises to half flood in 24 hours, and sometimes when no rain has fallen at Rochester.

A timber coffer dam in such a location was not thought of, and after careful consideration it was decided to use the rock blasted from the overhang above to fill up the pool below. A mass of stone blocks was thus raised 12 to 15 ft. above water and extending outside the foundation. Pumps with 4 and 6-in. section pipes were used to lower the water. At the point where the solid rock was highest the débris was then removed, level benches cut, a heavy footing course laid in Portland cement mortar and the masonry carried above high water. More broken rock was then removed for about 8 ft. further out, and the irregular spaces filled with dry cement mortar in bags trodden into place. The benching was then done, and the same process followed. By this method, which exposed only a small surface at any one time, all the footings were finally put in and the wall carried above water level. The cost was less than that of a coffer dam, even supposing the latter practicable. Stones of 1 to 2 cu. yds. were carried away by the current.

The second paper of the evening was by James Duane, M. Am. Soc. C. E., on "The Effect of Tuberculation on the Delivery of a 48-in Water Main."

Central Railway Club.

The annual meeting and banquet of the Central Railway Club was held at Buffalo on the 25th, President Eugene Chamberlain in the chair. Mr. Spear, the Secretary and Treasurer, presented his report. The present membership of the club is 154, the increase during the year having been 11½ per cent. The financial condition is also good. Hereafter the proceedings of the club will be printed in pamphlet form, the expense of printing being paid by advertisements.

President Chamberlain made a brief address, in the course of which he announced the death of their fellow member Mr. Henry C. Gould, Vice-President of the Gould Coupler Co., and a committee was appointed later to prepare a memorial of him.

A committee report was then received and discussed on defect cards and payment for repairs.

The following officers were elected: President, A. M. Waitt, of the Lake Shore; Vice-President, S. Higgins, of the Erie; Secretary and Treasurer, S. W. Spear. A vote of thanks was passed to Mr. Chamberlain and the retiring Vice President, Mr. Griffith.

President Waitt announced as the subject for the next meeting, "The best practice for increasing the efficiency of locomotives in combustion and prevention of smoke." A. A. Mitchell, of the Erie; J. D. Campbell, of the New York Central, and Fred B. Griffith, of the Lackawanna, were made members of the committee.

The banquet took place in the evening. T. A. Bissell acted as toastmaster.

Engineers' Club of Philadelphia.

The annual meeting of the club was held at 1122 Girard street, Philadelphia, Jan. 21, with 52 members and visitors present. Mr. James Christie, the retiring President, read his annual address, which gave a historical outline of the progress of engineering from early times and of its present needs and prospects. The address was referred for publication. The Board of Directors in their report called attention to the fact that a charter had been secured for the club early in January, so that it can now hold real estate and personal property. The by-laws have also been revised by a committee of the Board. During the year 64 active and 3 associate members have been elected, the net gain in membership for the year being 34. The club has 457 members, 276 of these being resident and 181 non-resident. The active resident members number 204. The Treasurer's report showed receipts for 1892 of $6,777, and expenditures of $6,078, leaving a cash balance of $699. The tellers reported the election of the following officers: *President*, John Birkinbine; *Vice-President*, James Christie; *Treasurer*, T. Carpenter Smith; *Secretary*, L. F. Rondinella; *Directors*, Henry J. Hartley, John L. Gill, Jr., and W. B. Riegner. The club, on motion of Mr. John Birkinbine, formally approved the proposed act for the creation of a State Forestry Commission for Pennsylvania.

PERSONAL.

—President S. H. H. Clark, of the Union Pacific, resigned as General Manager of the road on Feb. 1, and has been succeeded in the latter office by Mr. E. Dickinson, Assistant General Manager.

—Major Alfred F. Sears, M. Am. Soc. C. E., will deliver a lecture at the University of the City of New York on the morning of Feb. 9, at 9 o'clock; subject, "The Engineer as a Social Prophet."

—Mr. W. C. Irwin, formerly Chief Engineer of the Cleveland, Cincinnati, Indianapolis & St. Louis, the "Bee Line" division of the Big Four, has been appointed Consulting Engineer of the Central Trust Co., of New York.

—Mr. H. A. Gillis, who recently resigned as Division Master Mechanic of the New York, Lake Erie & Western, is to be General Foreman of the Roanoke Machine Works at Roanoke, Va., succeeding Mr. J. R. Hanthorn, resigned.

—Mr. W. T. Small, formerly Superintendent of Motive Power on the Northern Pacific, resigning in March,

1891, has been appointed Superintendent of Motive Power on the Buffalo, Rochester & Pittsburg, succeeding Mr. Alonzo Dolbeer, resigned.

—Mr. Charles D. Ives, who has been General Freight Agent of the Burlington, Cedar Rapids & Northern since 1887, has resigned. Mr. T. H. Simmons, Assistant General Freight Agent, has been appointed General Freight Agent of the road.

—Mr. Joseph S. Harris has resigned the vice-presidency of the Philadelphia & Reading Coal & Iron Company. Mr. Harris is President of the Lehigh Coal & Navigation Co., whose lines of railroad are leased to the Central Railroad of New Jersey.

—Mr. Andrew Rinker, until recently City Engineer of Minneapolis, Minn., has opened an office in the Lumber Exchange, in that city, with Charles Haglen as General and Consulting Engineer and Contractor. Mr. Rinker was City Engineer of Minneapolis for 16 years.

—Mr. T. H. Fennell, Superintendent of the Buffalo Division of the Lehigh Valley road, has been promoted to be General Superintendent of the Northern Division to succeed Mr. William Stevenson, resigned, who has been connected with the operating department of the Lehigh Valley for a number of years.

—Mr. Orville A. Roorbach, who has been for more than 33 years connected with the Northern Railroad of New Jersey, died in New York City, Jan. 26. He was born in Charleston, S. C., 60 years ago. He has been Secretary and Treasurer of the road, which is operated by the New York, Lake Erie & Western, for a long term of years.

—Mr. O. R. Whitney has been appointed General Superintendent of the New York & Yonkers Steamboat Co. and the Yonkers & Alpine Ferry Co., with office at No. 1 Broadway, New York City. Mr. Whitney was formerly Superintendent of Motive Power of the Alabama Midland, and was also connected with the West Shore and the Brooklyn & Sea Beach railroads.

—Mr. D. D. Curran, Superintendent of the Savannah & Western Division of the Central of Georgia, has recently resigned to accept the Superintendency of the New Orleans & Northeastern Division of the Queen & Crescent System, made vacant by the resignation of Superintendent G. Clark. Mr. T. S. Moise of Augusta, has been transferred to Columbus, Ga., as Mr. Curran's successor on the Central of Georgia, and Mr. W. A. Moore, Roadmaster at Columbus, has been appointed Superintendent of the lines of the Central of Georgia in South Carolina to succeed Mr. Moise.

—Mr. J. J. Frey, General Superintendent of the Missouri, Kansas & Texas, resigned last week, and it is understood that he is to take charge of the East Line & Red River road, a narrow gauge line of 150 miles in Texas, which is controlled by the Missouri, Kansas & Texas. Mr. Frey's successor as General Superintendent is Mr. A. A. Allen, at present Superintendent of the Everett & Monte Cristo road, now being built in Washington. Mr. Allen was formerly General Manager of the Wisconsin Central line and later General Manager of the Chicago terminals of the Northern Pacific.

— Mr. E. G. Russell, formerly Division Superintendent of the Illinois Central, has been appointed Superintendent of the Rome, Watertown & Ogdensburg to succeed Mr. Edgar Van Etten, who has been promoted to be General Superintendent of the New York Central & Hudson River road. Mr. Russell has been connected with the Illinois Central as Division Superintendent since 1889; first on the Wisconsin lines, and then as Superintendent of the Northern lines with office at Chicago, and for the past year as Superintendent of the Western lines with office at Dubuque, Ia.

—Mr. Edward Caldwell, who has been for nearly three years associate editor of the *Electrical World*, has resigned. He goes at once to Chicago to take up the duties of editor of the *Street Railway Gazette*. He and a group of friends have acquired a controlling interest in that journal and propose to make it a high class weekly street railroad publication. Mr. Caldwell was especially interested in this department of engineering and transportation for some time before he went into editorial work, having been connected with the Sprague Electric Railway & Motor Company and afterward in charge of the electrical equipment of the Brighton Division of the West End Street Railway of Boston.

—Isaac Collins Chesbrough, who died at his home in Copake Iron Works, N. Y., on Jan. 28, 1893, aged 78 years, was a civil engineer, occupied during the greater part of his life in the location and construction of railroads. He located the division of the Vermont Central Railroad, between Burlington and Bolton, in 1845, and became Chief Engineer of the whole road soon after. He resigned this office to become Chief Engineer of the Sullivan Railroad, which he completed. He was engaged on many railroads in the West and Southwest, but always maintained his home at Copake. He was a brother of E. S. Chesbrough, the distinguished hydraulic engineer, and among his assistants who became famous were the late Charles Collins and the late Moses Lane. Mr. Chesbrough was an able man, of the firmest moral fibre; very silent and retiring, except among intimates or where it was important to go to the front when he would always be found where needed.

—Mr. Charles G. Eddy, who was this week appointed Third Vice-President of the Philadelphia & Reading, has been Vice-President of the Norfolk & Western for six years in charge of traffic matters. Mr. Eddy was born in Richfield, N. Y., in 1841 and began his railroad career as a clerk in the freight office of the Milwaukee & Chicago Railroad at Milwaukee, a position which he retained until 1862. In that year he enlisted in the Union army. He became chief clerk in the freight office at Milwaukee of the Chicago & Northwestern, continuing with this company until 1868, when he became General Agent of the Lake Superior & Mississippi Railroad. He left this company in 1870 to take the agency of the Central Vermont Line, at Duluth, returning in 1871 as General Agent to the Chicago & Northwestern Company at Council Bluffs, Ia., and Omaha, Neb.; from 1873 to 1879 he was the Assistant General Freight Agent, being advanced in the latter year to General Freight Agent, a position which he held until January, 1883, when he became General Eastern Agent of the Missouri Pacific, with headquarters in New York City. In September of the following year he accepted the position of Freight Traffic Manager of the West Shore Railroad, leaving this company in October, 1886, to accept the Vice-Presidency of the Norfolk & Reading road. As Vice-President of the Norfolk & Western he was in charge of both its freight and passenger traffic, having his headquarters at Roanoke, Va.

—Mr. E. H. Beckler, who resigned the positions of Chief Engineer of the Pacific extension of the St. Paul, Minneapolis & Manitoba (Great Northern), the Seattle & Montana and the Montana Central roads on Jan. 18, is only 38 years of age, and has been in charge since he began his career as a railroad engineer of a large amount of important work. He graduated from the state college of Maine and in 1879 entered the service of the St. Paul, Minneapolis & Manitoba as Associate Engineer, in charge of the line under construction from Fergus Falls to Barnesville, Minn. In the spring of 1880 he entered the engineering department of the Northern Pacific, then under construction. As resident engineer he was in charge of some of the most important work, notably the Bozeman tunnel. After the Northern Pacific was completed through to the coast he accepted service with the Canadian Pacific in 1884, and for a year had charge of bridge construction on the Rocky Mountain section. In the spring of 1885 he returned to the Northern Pacific and had charge of the building of the bridge across the St. Louis River from Duluth to West Superior. In Jan., 1886, he was appointed principal Assistant Engineer of the Montana Central. In the fall of 1887 he was given the title of Chief Engineer, and continued in that position during the construction of the line. In 1889 he was placed in charge of the Pacific extension of the St. Paul, Minneapolis & Manitoba, with the title of Chief Engineer of the Pacific extension. Later he received the title of Chief Engineer of the Seattle & Montana. Mr. Beckler has not decided what business he will engage in, but is too well and favorably known as an engineer to remain long idle.

ELECTIONS AND APPOINTMENTS.

Brownstone & Middletown.—At the annual meeting held Jan. 23 these directors were elected: Allen Walton, President; Directors, Allen K. Walton, John J. Nissley, H. O. Deshong, R. J. Walton, Morris Ebert and E. A. Penney. The board subsequently appointed Allen K. Walton, Treasurer and General Manager; R. J. Walton, Superintendent, and E. A. Penney, Secretary, all with offices at Waltonville, Dauphin County, Pa.

Colorado Midland—E. F. Rittenhouse has been appointed Assistant Superintendent, with headquarters at Colorado Springs, Col. R. C. Bowdish, Trainmaster, has been promoted to be Assistant Superintendent, with headquarters at Leadville, Col.

Des Moines, Northern & Western.—S. A. Stevenson has resigned the position of General Passenger Agent to accept service elsewhere. The office has been abolished. Horace Seely has been appointed Assistant General Freight and Passenger Agent, with office at Des Moines, Ia.

East Tennessee, Virginia & Georgia.—Superintendent E. T. Horne, of the Selma division, has been appointed to succeed Superintendent W. J. Murphy, on the Brunswick division. His headquarters will be at Brunswick, Ga.

Excelsior Springs.—At a meeting of the stockholders at Kansas City, Jan. 26, S. F. Scott, of Kansas City, was elected President and General Manager; H. M. Holden, Vice-President; H. E. Robinson, Treasurer; W. A. Butterfield, Secretary; and A. E. Pinkney, Auditor. Directors were elected as follows: Daniel P. Daugherty, T. A. Scott, H. E. Robinson, H. N. Garland, H. M. Holden and S. F. Scott. This is a new road and was described last week.

Gulf, Western Texas & Pacific.—The annual meetings of the Gulf, Western Texas & Pacific and the New York, Texas & Mexican were held at Victoria, Tex., last week. The following directors for both companies were elected: C. P. Huntington, J. Kruttschnitt, M. D. Monserrate, W. G. Van Vleck, D. C. Proctor and A. Da Costa. The directors elected the following officers: J. Kruttschnitt, President; M. D. Monserrate, Vice-President; W. J. Craig, Treasurer; C. D. Wells, Secretary.

Kansas City, Pittsburgh & Gulf.—The annual meeting of this road was held at Kansas City, Jan. 26, and the following directors were elected: E. L. Martin, A. E. Stillwell, Richard Gentry, C. J. White, W. H. Lucas, E. T. Stolesberry, J. L. Welch, A. A. Mosher, W. S. Taylor, E. P. Merwin, A. Hecksher. The officers are: President, E. L. Martin; Vice-Presidents, A. E. Stillwell, Richard Gentry and A. A. Mosher; Secretary, W. S. Taylor; Assistant Secretary, A. L. Howe.

Lehigh & Hudson River.—The following changes are in effect from Feb. 1, 1893: N. L. Furman, having tendered his resignation as Superintendent, correspondence pertaining to transportation will be addressed to W. E. Bailey, Superintendent of Transportation, Warwick, N. Y. Other communications relative to the operating department to J. H. Olhausen, General Superintendent, Jersey City, N. J., or to Grinnell Burt, General Manager, Warwick, N. Y.

Lonaconing & Cumberland.—The directors met at Cumberland, Md., on Jan. 25, and elected John J. Bell, of Lonaconing, Md., President; George W. Clark, of Lonaconing, Vice-President; William Pearre, of Cumberland, Secretary and Treasurer, and Frank V. L. Turner, of Washington, D. C., General Manager.

Memphis & Charleston.—C. L. Johnson has been appointed Treasurer for the receivers of the railroad, in place of H. C. Wilton, relieved by reason of ill-health. The office of the Treasurer will be at Memphis.

Mexican National.—G. N. Collum has been appointed Assistant General Freight Agent of this company, with headquarters at Calle de Ortega No. 28, City of Mexico.

Monterey & Fresno.—The following directors were recently elected at a meeting in Fresno, Cal.: A. W. Jones, Kansas City; C. L. Walter and Alex. Gordon, of Fresno, Cal.; H. A. Greene, of Monterey, Cal.; W. J. Hill, of Salinas, Cal.; William Palmtag, of Hollister, and Thomas Flint, of San Juan, Cal. T. C. White has been elected Treasurer.

Natchez, Red River & Texas.—The annual meeting was held at Vidalia, La., Jan. 26. The following were elected directors: S. E. Rumble and Louis Botto, of Natchez; Geo. W. Debevois, C. H. Stone, and Hugh Porter, of New York; C. A. Gardner, of Vidalia; Wm. H. Murphy, of New York. The directors elected the following officers: President and Treasurer, Hugh Porter, of New York; Vice-President and General Manager, C. A. Gardner, of Vidalia; Secretary, Wm. H. Murphy, of New York.

New York Central & Hudson River.—John D. Campbell, Assistant Superintendent of Motive Power and Rolling Stock, who has been located at West Albany for some time, has had his headquarters transferred to Buffalo and now occupies an office in the Exchange street station. Mr. Campbell has taken charge of the work of arranging the new Depew shops near Buffalo.

New York & New England.—Superintendent George H. Cross, of the western division of the road, has resigned, and F. E. Dewey, Superintendent of the eastern division, is temporarily performing his duties.

New York & Yonkers Steamboat Co.—At a recent meeting of the board of directors of the New York & Yonkers Steamboat Co. and the Yonkers & Alpine Ferry Co., held at their office, No. 1 Broadway, New York, the following officers were elected: R. W. Bissell, President; W. W. Rider, Vice-President; Percy Jackson, Secretary; O. R. Whitney, General Superintendent, and W. M. Safford, General Counsel.

Norfolk & Western.—J. J. Archer has resigned as Division Passenger Agent of the Scioto Valley & Kenova division, and the business hereafter will be conducted by W. B. Bevill, the General Passenger Agent.

Pennsylvania Co.—The following changes in the passenger department were announced to take effect Feb. 1: H. R. Dering, Assistant General Passenger Agent at Cincinnati, to be Assistant General Passenger Agent at Chicago; Samuel Moody, District Passenger Agent at Pittsburgh, to be Assistant General Passenger Agent at Cincinnati; J. G. Ruple, District Passenger Agent at Columbus, to be District Passenger Agent at Pittsburgh, and J. M. Harris, Chief Clerk at Chicago, to be District Passenger Agent at Columbus.

Philadelphia & Reading.—A circular was issued Feb. 1, announcing that the organization of the departments will be as follows: Executive Department: A. A. McLeod, President; Charles Hartshorne, Third Vice-President; Robert H. Sayre, Fourth Vice-President; John Russell Young, Fifth Vice-President; J. D. Campbell, General Solicitor; Henry S. Drinker, Assistant to President; W. A. Church, Treasurer; W. R. Taylor, Secretary, and D. Jones, Comptroller. Operating Department: Theodore Voorhees, First Vice-President. The First Vice-President will have charge of the operations of all railroad and other transportation lines owned, leased or controlled by this company, reporting to the President. His office will be at No. 227 South Fourth street, Philadelphia. I. A. Sweigard, General Manager; C. M. Lawler, General Superintendent Main Line Division; Rollin H. Wilbur, General Superintendent Eastern Division. T. H. Fennell, General Superintendent Northern Division, in place of Wm. Stevenson, resigned. John Gordon, General Manager Lehigh Valley Transportation Company. The Main Line Division will hereafter include all lines of railroad and canal of this company, excepting those forming the Eastern and Northern Divisions of the Lehigh Valley Railroad. Traffic Department: Charles G. Eddy, Second Vice-President. The Second Vice-President will have general supervision of traffic of all commercial matters connected with the business of the company, and of traffic relations with other companies, reporting to the President. His office will be at No. 227 South Fourth street, Philadelphia. John Taylor, General Traffic Manager; B. H. Bail, General Freight Agent; G. F. Randolph, First Assistant General Freight Agent, and C. G. Hancock, General Passenger Agent.

The changes are that Charles Hartshorne, Second Vice-President, makes way for Charles G. Eddy. Mr. Hartshorne becomes Third Vice-President in place of Robert H. Sayre, who becomes Fourth Vice President, and John R. Young, the present Fourth Vice-President, becomes Fifth Vice President. The duties of Messrs. Hartshorne, Sayre and Young are in no wise changed or disturbed. C. M. Lawler, present Assistant General Manager, becomes General Superintendent of the Main Line Division, in place of M. F. Bonzano, who becomes Assistant to the Fourth Vice-President. The appointment of Mr. Wilbur as General Superintendent of the Eastern Division was made in January. The appointment of John Gordon as General Manager of the Lehigh Valley Transportation Co., controlling the company's fleet of lake steamers, was made several months ago. The changes and reorganization are made with an idea of lessening to some extent the pressure of the President's duties regarding the details of management.

Pittsburgh & Lake Erie.—The annual meeting was held at Pittsburgh, Jan. 29. The following directors were elected: President, John Newell; Directors, Cornelius Vanderbilt, William K. Vanderbilt, F. W. Vanderbilt, Hamilton McK. Twombly, E. D. Worcester, M. W. Watson, Henry Hice, A. E. W. Painter, James M. Bailey, J. H. Reed, J. M. Schoonmaker, and D. Leet Wilson.

Troy Union.—F. A. Harrington, Superintendent of the Mohawk Division of the New York Central & Hudson River road, has been appointed Managing Director of the Troy Union Railroad, in place of Theodore Voorhees.

Waco & Northwestern.—Receiver Abeel, of Waco, Tex., has announced the following appointments: P. A. Gorham, formerly Roadmaster of the Texas Central, to be General Superintendent; C. A. Richardson, Secretary, and J. N. Fields, General Freight Agent, all at Waco, Tex.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Burrard Inlet & Fraser River Valley.—A press dispatch from Tacoma states that the contract was let last week to Percy Dickinson & Co., of Tacoma, for building this road from Sumas City, a point on the Seattle, Lake Shore & Eastern, near the international boundary line, north to Vancouver, B. C., a distance of about 49 miles. C. D. Rand, of Vancouver, is President.

Canadian Pacific.—McGillivray & Co., who have built several new lines in British Columbia, are reported to have been awarded a contract to build a branch from Sumas, Wash., near the international boundary line to Chilliwack, B. C., a distance of 14 miles. The company has controlled a franchise for this line for some time, and it is said that the prospects of the Burrard Inlet & Fraser River Valley road being built caused the line to be put under contract.

Chicago, Rock Island & Pacific.—The Texas extension has been opened from Terral, I. T., south to Bowie, Tex. The following offices have been established: Terral, I. T.; Ringold, Tex.; Stoneburg, Tex., and Bowie, Tex.

Cincinnati, Union City & Chicago.—J. W. Fawcett, President of the Louisville company, with the contractor, is going over the line arranging for the right of way. They announce that the road will be completed by July 1, 1893. The road is to start at Union City and extend north to Huntington, Ind., through the towns of Portland, Camden and Bluffton.

Clarksville Mineral.—This branch of the Louisville & Nashville was transferred from the construction to the operating departn ent on Feb. 1, when trains began running regularly over the entire line from Clarksville south to Dickson, Tenn., 30 miles. The road was completed in 1890, except seven miles on the middle section, which, owing to litigation with the contractors, was not completed until last fall.

Colorado Midland.—The earthwork grading of the Cripple Creek branch north of Divide, Colo., has been suspended on account of the cold weather, though that work is now practically completed, and the contractors, Price & McGavock, of Pueblo, still have a considerable force on the rock work. It is said that the line can be completed to Midland in two weeks from the time the track laying begins. The work on the Midland Terminal, the narrow gauge line north of Midland, Colo., to the Cripple Creek mines is not so far along, and it is not expected that trains will be running to the mines before April.

Cross Fork.—This is the corporate title of one of the branches of the Sinnemahoning Valley road being built through the northern counties of Pennsylvania. The Cross Fork is a branch of the Buffalo & Susquehanna beginning at Shinglebolt Summit about five miles east of Hulls, Pa , on the Buffalo & Susquehanna, following Cross Fork Creek to Kettle Creek, a distance of 12½ miles. The contractors are D. C. Crage, of Buffalo, N. Y., who has nine miles of the line, and Frank Greco, of Conrad, Potter County, Pa. The work is not very heavy, and the only bridge work is 300 ft. of trestle and two wooden bridges of 50 ft. span and one of 100 ft. The road will be completed in July. F. W. Goodyear, of Buffalo, is President, and C. E. Botsford, of Austin, Pa., Chief Engineer of the Buffalo & Susquehanna, is Chief Engineer also of the branch road.

Danbury & State Line.—At a hearing before the Connecticut Railroad Commissioners the plan of this road was approved. The road will be 14 miles long, and will extend from Danbury west through Ridgefield, Conn., and North Salem, N. Y., to Goldensbridge, where it will join the New York & Harlem road. The distance will be shortened between Danbury and New York about 20 miles by the new road. The incorporators are mostly residents of Danbury, Conn. J. S. King, of New York, is one of the projectors.

Denver Belt Line.—Articles of incorporation were filed in Colorado this week, with a capital stock of $500,000, to build a belt line around Denver and its suburban towns, connecting with all the roads now entering that city. The line touches or passes through Garfield Heights, Valverde, South Denver, Leetsdale, New England and Boston Heights, Swansea and Berkeley, crossing the Platte River twice. The directors are E. W. Lowery, Robert Y. Force, Henry C. Brooks, Assyria Hall and Howard L. Morris. R. Y. Force, of Denver, is Manager.

Florida Midland.—The extension of the Florida Central & Peninsula road to Savannah is being built under this charter. The Southern Supply Co., which is building the road, has nearly 1,500 men at work scattered all along the line, and engaged principally in clearing the right of way. The road is 113 miles long, extending from Hart's Road, Fla., near Jacksonville, north to Savannah, and is to be completed early next fall. The road crosses the Satilla, St. Mary's, Altamaha and Ogechee rivers, with draw-bridges of 666 ft., 420 ft., 410 ft. and 342 ft. respectively. W. S. Greene, of Jacksonville, is President.

Fort Worth & Rio Grande.—The preliminary surveys for the proposed southwestern extension from Brownsville, Tex., begun some weeks ago, is still in progress. The surveyors have reached the Colorado River and are said to be working toward Fort McKavett, on the Southern Pacific.

Great Salt Lake & Hot Springs.—A company called the Utah & Nevada Coal & Construction Co. has been organized at Salt Lake City by Allen G. Campbell, President; Simeon Eisman, Secretary, and H. M. McCartney, Manager, to build the proposed extension of this road to the coal mines at Coalville in eastern Utah. The extension will be about 65 miles long, the line running north from Salt Lake City to the Weber River, and thence east and southeast along that river parallel to the Union Pacific to Coalville. The first 10 miles north of Salt Lake City has been completed and most of the construction material to complete the line from Bountiful north to Farmington, six miles, is on hand. H. S. Joseph, of Salt Lake City, is Chief Engineer of the line.

Hot Springs.—A bill has been introduced in Congress to grant to Geo. W. Baxter, Geo. M. Baxter, John D. Ware and Lester Webb, of Hot Springs, Ark., authority to construct a railroad through the Hot Springs reservation.

Interoceanic (Mexico).—The company has applied to the Mexican Government for permission to build an extension 20 miles in length, from Jojutla to Amacusac, Mex., and it is proposed to start surveys as soon as the permission is granted.

Johnsonburg & Bradford.—The Buffalo, Rochester & Pittsburgh has commenced running east bound freight trains over this road between Mt. Jewett and Howard Junction, Pa., 20 miles. Passenger trains will not be run until spring.

Lonaconning & Cumberland.—At the meeting of the stockholders held at Cumberland, Md., Jan. 25, it was decided to push the preparations for building the line as rapidly as possible so that the work of construction may begin early in the spring. The counties through which it is to pass have granted liberal concessions and valuable franchises. A full description of this line and a list of incorporators appeared in the *Railroad Gazette* of Jan. 20.

Mexican Roads.—Chopin Bros., of Esperanza, Mex., have a concession from the Mexican Government for a branch line eight miles long, to extend from Esperanza to Suchil, Mex. The road will be used principally to bring wood for use on the main line and branches of the Mexican (Vera Cruz) road.

Minnesota & Wisconsin.—An extension of this line from Emerald, Wis., on the Wisconsin Central is under contract for a distance of 16 miles north of that point, and the work is to be completed early next spring. This road is now completed from Emerald south to Spring Valley, Wis., crossing the Chicago, St. Paul, Minneapolis & Omaha at Woodville, Wis., the total length of the line being 26 miles. An extension is proposed from Spring Valley south to Durand, connecting with the Chicago, Milwaukee & St. Paul, a distance of 26 miles, and it is probable that the construction work on this line will be begun when work on the northern extension has been finished. Hon. D. M. Sabin, of Stillwater, Minn., is President, and E. F. Dodge, of Stillwater, is Traffic Manager.

Missouri, Kansas & Texas.—The contractors began laying track east of Eureka, Tex., on the Houston & Texas Central some weeks ago on account of the delay at the bridge work over the Brazos River, and it is now stated that the track has been laid to the Houston city limits. The contractors, Burkett, Murphy & Burns, have moved their plant back to Sealey, Tex., and are working east of that town to complete the gap.

Monterey & Fresno.—The articles of incorporation for this line, which has been talked of for some months, were filed in Fresno County, Cal., recently. The preliminary survey is now being made by McCray Brothers from Monterey, Cal., toward the Fresno Valley. The road is to extend from Monterey southeast through the towns of Salinas, San Juan and Hollister to Fresno, a distance of about 150 miles. The projectors have, it is reported, secured a subsidy of $50,000 from Monterey County and $50,000 from San Benito County. A. W. Jones, formerly of Kansas City, is the largest stockholder; T. C. White and Thomas E. Hughes, of Fresno, are the principal local incorporators.

Natchez & Pascagoula.—The projectors have secured the right of way for this line except on one section, and President T. W. Flint, of Moss Point, Miss., says that grading will begin when this piece of property is secured. The road is to be built from Moss Point to Pascagoula, Miss , 10 miles, connecting with the Louisville & Nashville.

New Roads.—The Peace River Phosphate Co. has a force of men at work building a road along the river front from the company's works at Arcadia, Fla., to a point near the mouth of Joshua Creek, a distance of about three miles.

The preliminary survey for the new road from Highlands, Ill., to Dodgeville, Wis., a distance of 25 miles, has been completed by Engineer Gates, of Rockfotd, Ill. A portion of the construction material is said to have been already purchased. The road will tap the oxide zinc mines, which are being extensively worked, and several of the largest mine owners are interested in the project.

Norfolk & Western.—Work on the North Fork Extension of the Ohio River division in West Virginia is being pushed rapidly forward. The road is in operation four miles and is to be extended ten miles. It is to reach valuable coal deposits, and already eight concerns are in operation along the four miles that are completed.

North Carolina Roads.—Bills have been introduced in the state legislature to incorporate the Virginia & North Carolina, the Atlantic & Ohio and the Burlington & Southwestern roads.

Ohio Southern.—The locating surveys for the extension to Lima, O., from Springfield were completed to the former point last week. The distance is about 60 miles, and work is already under contract to McArthur Brothers, of Chicago, who began the grading near Springfield in December. A mortgage in favor of the Central Trust Co. of New York, to secure an issue of $4,000 000 of bonds, was filed in various counties in Ohio last week.

Oklahoma Midland.—The bill recently introduced in Congress by Representative Harvey, of Oklahoma Territory, authorizing the company to build this line through the Indian and Oklahoma territories, has passed the House of Representatives. The northern terminal of the new line is given in the charter as Joplin, and the line is to extend southwesterly through Indian and Oklahoma territories. A. J. Vanlandingham, of Kansas City, is President, and H. M. Fickenger, of Little Rock, Manager. Other officers were given in our issue of Jan. 6.

Ortonville & Southern.—New directors were elected by this company at a meeting at Ortonville, Ia., last week. The project is to build a line from the Iowa State line, in Nobles County, through Nobles, Murray, Lincoln, and Lac-qui-Parle counties to Ortonville. The new Board of Directors is as follows: William Van Eps, of Sioux Falls, S. D.; R. Norrish and C. H. L. Lange, of Ortonville, Ia.; G. A. Moore and T. M. Grant, of Minneapolis, and C. E. Dinehart and Jay Henry Long, of Slayton.

Pennsylvania.—The following new construction work is about to be placed under contract on the Philadelphia Division: To complete one additional track on the North side between mile post No. 76 and mile post No. 78, on the Columbian Branch, a distance of 2 miles; one additional track on the North side from Berwyn to a point 800 ft. east of Bear Bridge (one-half mile east of Paoli), a distance of 1½ miles, and also one track on the south side from thence to Green Tree, 1½ miles; one additional track on the south side between Green Tree and Frazer, Pa., a distance of 4 miles; one track on the north side between Ship Road and Valley Creek, a distance of 3 miles; one track on the north side between Downingtown freight station and Coatesville tower, a distance of about 6 miles; one track on the south side from the east end of third track west of Gordonville to Bird-in-hand, about 3½ miles; a new passenger connection between Trenton Cut-off and main line east of Glen Lock, about 1 mile, and one additional track on the south side of the Trenton Cut-off immediately east and west of the crossing of the Philadelphia, Newtown & New York R. R., a distance of 1 mile.

Philadelphia Belt Line.—The company was last week granted permits by the Board of Highway Supervisors to lay tracks on Delaware avenue, Philadelphia, from Catharine to Almond street, and on Delaware avenue, south of Pine street, into Pier 22 south.

Philadelphia & Northern.—As soon as the short branch of the Philadelphia & Reading between Logan and Olney is finished, the plant of the contractors will be moved to near Wister Station, Pa., on the Germantown branch of the Philadelphia & Reading, and the work will be started on this road, which is to extend from Wister Station to Glenside, on the North Penn road, a distance of six or seven miles. The right of way for the entire distance has been secured, and the work will be pushed with energy. The construction of the road, however, will probably not be finished this year. At Glenside, connection will be made with the Northeast Pennsylvania road.

Philadelphia & Reading.—The work of construction of the short branches north of Philadelphia, the lines from Logan to Olney, on the Philadelphia, Newtown & New York road, and from Crescentville to Frankford, is still carried on, and the contractors are now working night and day forces. Both lines will probably be ready for traffic by April 1. Between the North Penn bridge and the stone bridge over Fifth street the grading is practically completed, the embankment being for the greater part of the distance fully 50 ft. high. From Fifth street to Olney a great deal of filling is still required.

The company recently began work on the construction of a branch from the main line at West Conshohocken near Philadelphia to extend along the Gulf Creek to Gulf Mills, where several thriving industries are located.

Portland, Monterey & Gulf.—The local newspapers state that construction work has been commenced on this new road to Portland, Tex., a town opposite Corpus Christi, on the San Antonio & Aransas Pass road. The new road is projected to Monterey, Mex., via Sharpsburg, Tex , where it will cross the Neuces River, Banquette on the Mexican National, and Brownsville on the Rio Grande road.

Potomac & Appalachian.—The engineers have run the preliminary survey as far as Moorefield, Hardy County, W. Va., and have been transferred to Petersburg, Grant County, to cover the route from that point to Cumberland, Md. J. T. Ford, of New York, and J. C. Bradford, of Harrisonburg, Va , are in charge of the engineering work. This company was chartered in West Virginia, Dec. 14 last, to build a road from a point opposite Cumberland, Md., south along Patterson's Creek and Luney's Creek to Petersburg, Grant County, thence following the south branch of the Potomac River to Franklin, Pendleton County. The incorporators are: W. J. Cowger, of Rockingham County, Va.; H. W. Jones, of Highland County, Va.; Wm. C. Kiser, of Franklin, W. Va.; J. T. Kile, of Upper Tract, W. Va.

Rio Grande Western.—A branch from Kyune, Utah, to Asphalt mines, about three miles from that place, is now nearing completion, and rails are also being laid on a short branch beginning near Thistle, Utah.

Rocky Mountain & Pueblo.—The company has been incorporated in Colorado to build a "rapid transit" line between Pueblo and Overton, the oil refinery settlement of the Rocky Mountain Oil Company. The directors are John Coon, Geo. H. Hobson, A. E. Crane, A. J. Overton, of Pueblo, and H. M. Claflen, of Cleveland, O.

St. Louis, Chicago & St. Paul.—Johnson Brothers & Faught, the contractors who are building the line between Alton and St. Louis, 21 miles, have a large force of men working near Alton, Ill., and the new line has been graded for some distance from that town. The rails are being delivered at Alton, and the tracklaying will begin as soon as the frost is out of the ground. It is expected that the new line will be completed to the connection near Madison with the St. Louis Merchants' Bridge Terminal System by April 1.

San Diego, Cuyamaca & Eastern.—Nathan Watts and O. J. Slough, capitalists, and C. J. Fox, engineer, of San Diego, Cal., spent several days at Prescott, Ariz., recently, in connection with the proposal to extend this partly completed road from San Diego, but it is not stated that they were able to make any arrangements to resume work.

Sioux Falls, Yankton & Southwestern.—About 100 teams and men are still employed on the grading of this line from Sioux Falls, S. D., and even a larger force than this has been working continuously through the winter on the grading. The line is being built from Sioux Falls southwest through Lennox and Violin to Yankton, S. D., a distance of 63 miles. The location has been completed to the Missouri River at Yankton and most of the grading sublet. The maximum grades on the line are 30 ft. to the mile and the curves are three degrees. Hon. R. F. Pettigrew is President and W. H. Knowlton, of Sioux Falls, S. D., is Chief Engineer.

Texas Midland.—A party of engineers under Martin Duvall, Chief Engineer, began the preliminary survey last week for the proposed extension from Roberts, the northern terminus of the road, northeast to Paris, Tex., a distance of about 60 miles. The line now being run is through Sulphur Springs and Cooper to Paris, but as soon as the survey has been made for this road another line will be run through Greenville to Paris. President E. H. R. Greene, of Terrell, Tex., states that the construction of this extension will be begun early in the spring. Surveys will also be made shortly for the proposed southern extension from Garrett southwest to Waco, Tex.

Wabash.—It is announced that the new Detroit and Chicago extension will be opened for regular through traffic on March 1. It is said that three trains will be run daily between Detroit and Chicago over the new division. The new line is about 148 miles long, extending from Montpelier, O., west through northern Indiana to Hammond, where it connects with the Chicago & Northern Pacific.

Yankton, Norfolk & Western.—All construction work on this line south of the Missouri River in Nebraska, has been suspended, because, it is said, the projectors have been unable to secure funds to complete the road. The road is nearly all graded between Osmond, opposite Yankton, S. D., to Norfolk, Neb., 25 miles.

GENERAL RAILROAD NEWS.

Chicago, Burlington & Quincy.—The report of earnings for December and the fiscal year ending Dec. 31, were as follows:

Month of December:	1892.	1891.	Inc. or dec.
Gross earn	$3,514,275	$3,524,478	I. $19,797
Oper. expen	2,215,711	2,216,054	D. 343
Net earn	$1,298,564	$1,308,424	I. $20,140
Fixed charges	810,000	795,186	14,813
Surplus	$518,764	$513 238	I. $5,327
Year ending Dec. 31:			
Gross earn	$40.412.401	$35,352,375	I. $5,060,02
Oper. expen	26,158,996	21,942,380	I. 4,216,616
Net earn	$14, 53,405	$13,409.995	I. 843,410
Fixed charges	9,720,000	9,542,234	I. 177,765
Surplus	$4,533 405	$ ',867,761	I. $665,645

Cleveland, London & Port Stanley.—The London City Council has ratified the lease of the London & Port Stanley road to a syndicate of Cleveland capitalists and the $25.000 security required has been deposited. The lease will be effective on March 1. The company is to be organized as the Cleveland, Port Stanley & London Rail & Transportation Co., with a capital of $250,000. Frank S. Miller and C. R. Jones, of Cleveland, are heavily interested. Two large car ferries have been bought by the company from the Grand Trunk for use in transferring cars between Cleveland and Port Stanley. The railroad is 24 miles long, extending from Port

Stanley to London, Ont., and is operated by the Grand Trunk, the stock being owned by the town of London.

Delaware & Hudson Canal Co.—The preliminary annual report issued last week gives the following results for the year:

	1892.	1891.	Inc. or dec.
Receipts from coal	$9,629,333	$8,335,009	I. $1,294,324
Railroad earnings	10,356,444	10,062,323	I. 294,121
Miscellaneous	452,764	711,869	D. 259,105
Total gross	$20,438,541	$19,109,201	I. $1,329,340
Operating expenses	13,977,757	13,511,776	I. 465,981
Net earnings	$6,460,784	$5,597,425	I. $863,359
Fixed charges	3,425,320	3,393,377	I. 31,943
Balance	$3,035,464	$2,204,049	I. $831,416

Delaware, Lackawanna & Western.—The preliminary annual report for the year ending Dec. 31 gives the following figures:

	1892.	1891.	1890.
Gross earnings	$46,226,283	$41,819,754	$40,668,645
Operating expenses	37,711,889	34,891,539	32,491,858
Net earnings	$8,414,403	$7,955,155	$8,188,787
Interest and rentals	5,366,496	5,418,226	5,328,494
Betterment	464,539	121,474	240,019
Balance	$2,613,466	$2,415,464	$2,620,273
Dividends	1,834,000	1,834,000	1,831,000
Surplus	$779,467	$581,464	$786,273
Coal transported, tons	9,327,446	9,006,824	8,039,469

Kansas City & Independence Air Line.—At a meeting of the stockholders on Jan. 25 the sale of the property to the Kansas City Suburban Belt was formally approved. The company owns about five miles of track from Independence to a point on the Missouri River, at Air Line Junction, and has run its trains into Kansas City, six miles, over the Kansas City Suburban Line. The stock of the company has been increased to $500,000. It is nearly all owned by the Kansas City Suburban Belt Line.

Kansas City, Pittsburgh & Gulf.—At a meeting of the stockholders of the Kansas City, Nevada & Fort Smith in Kansas City, Mo., on Jan. 25, it was voted to change the title of the road as above. The road is now in operation from Kansas City to Clayton, Mo., and is nearly graded to Pittsburg, Kan., about 50 miles beyond the present terminus of the operated line.

Louisville & Nashville.—The statement for the month of December is as follows:

	1892.	1891.	Inc. or dec.
Gross earn.	$2,030,897	$1,791,151	I. $239,746
Oper. expenses	1,130,313	1,185,256	D. 54,943
Net earn	$900,584	$605,895	I. $294,689
Six months:			
Gross earn.	$11,684,929	$11,061,173	I. $623,756
Op'g. expen.	7,173,607	7,048,707	I. 124,900
Net earn.	$4,511,322	$4,012,466	I. $498,856

North Pacific Coast.—A suit has been filed at San Francisco to foreclose a mortgage for $150,000 on this road. The plaintiff is the Scottish American Investment Co., and the mortgage was given for the money used in the construction of a portion of the road, which is now overdue.

New York, Lake Erie & Western.—The earnings of this system for the month of December are given in the following table:

	1892.	1891.	Inc. or Dec.
Gross earnings	$2,539,137	$2,641,561	D. $102,424
Oper. expenses	1,713,010	1,838,098	D. 125,088
	$826,127	$803,463	I. $22,664
Due to leased lines	233,913	242,725	D. 8,812
Net earnings	$592,214	$560,738	I. $31,476
Oct. 1 to Dec. 31.			
Gross earnings	$7,880,873	$8,199,732	D. $318,859
Oper. expenses	5,146,930	5,487,312	D. 340,352
	$2,733,913	$2,712,420	I. $21,493
Due to leased lines	722,197	716,942	I. 5,255
Net earnings	$2,011,716	$1,995,478	I. $16,238

New York & Massachusetts.—Russell Sage, of New York, has, it is reported, purchased the first mortgage bonds of the Poughkeepsie, Hartford & Boston and all judgments against the company for $70,000. The road is now operated under the above title. It is about 40 miles long and extends from Boston Corners, N. Y., to Poughkeepsie. The funded debt by the last statement was $24,000 first mortgage seven per cent. bonds, although the authorized issue is $300,000. An authorization exists for $2,750,000 first mortgage five per cent. bonds, and this mortgage will probably be used to reorganize the property.

Pennsylvania.—The report of earnings for December on lines east of Pittsburgh and Erie shows the following results:

	1892.	1891.	Inc. or Dec.
Gross earnings	$5,934,925	$5,796,831	I. $138,094
Operating expenses	4,403,446	4,233,319	I. 170,127
Net earnings	$1,531,479	$1,563,512	D. $32,033

Western lines for the month show a gross increase of $49,975, and a net decrease of $51,366, making a net decrease for the system of $83,399.

	1892.	1891.	Inc. or Dec.
Gross earnings	$68,841,835	$67,426,831	I. $1,415,004
Operating expenses	48,819,352	45,947,435	I. 2,817,917
Net earnings	$20,022,483	$21,479,396	D. $1,456,913

The Western lines for the year show a gross increase of $2,999,942 and a net decrease of $187,462, making for the system a gross increase of $4,414,946, and a net decrease of $1,644,375.

Philadelphia & Reading.—The earnings of this system for December, the first month of the fiscal year, are shown in the following table:

	1892.	1891.	Inc. or Dec.
Gross earnings	$1,968,368	$1,881,522	I. $86,845
Operating expenses	1,051,432	973,838	I. 77,594
Profit in operating	$916,935	$907,684	I. $9,251
Other receipts	33,520	39,970	D. 6,450
Profit for month	$950,455	$947,654	I. $2,801
Expenses for per. imp.	41,091	18,418	I. 22,673
One-twelfth fixed charges	650,000	625,840	I. 24,160
	$691,091	$644,258	I. $46,833
Surplus	$259,334	$303,396	D. $44,032

The gross earnings for the Philadelphia & Reading Coal & Iron Company for December 1892 were $3,317,735, and in December 1891 were $1,784,123. The surplus for 1892 was $31,304, an increase of $24,479 over 1891.

Judge Metzger, of the Common Pleas Court, in Lycoming County, on Jan. 26, filed his opinion in the equity case of M. H. Arnot, of Elmira, N.Y., a stockholder in the Lehigh Valley, to rescind the leases with the Lehigh Valley Railroad. Judge Metzger sustains the Master, W. W. Hart, who found in favor of the Reading. After reviewing the history of the case and quoting the railroad section of the Constitution of Pennsylvania, Judge Metzger proceeds to show by the testimony presented before the Master that the consolidation was not in violation of the Constitution. He finds that the Philadelphia & Reading and the Lehigh Valley roads are not competing lines in the legal interpretation of the phrase, and hence the agreement was not contrary to law. He says that mere incidental competition between branches or spurs of two systems will not prevent the consolidation of their main lines. The Reading and the Lehigh Valley are not competing lines. Where the roads are so situated with respect to each other that it is not possible for them to be substantial competitors for traffic from the same shippers or transporters they are not within the mischief intended to be remedied by the framers of the Constitution. It is not the destination of the freight or traffic alone which makes the lines competing. His Honor orders and decrees that the exceptions be dismissed and the report of the Master be confirmed, and that the bill of the plaintiff be dismissed with costs. The case will be appealed.

Portland & Rochester.—The company has petitioned the Maine Legislature for authority to issue bonds to an amount not exceeding $1,000,000, to be used for improving its road and laying additional tracks and sidings, enlarging its stations and the purchase of new equipment.

Port Royal & Augusta.—In the United States Court, at Charleston, S. C., on Jan. 30, J. H. Averill, recently appointed receiver of the road, filed a petition asking that the order of the court appointing H. M. Comer, of the Central of Georgia, Receiver of the Port Royal & Augusta road be rescinded, and that the latter road be turned over to the petitioner. The court issued a rule to show cause on Feb. 14 why the petition should not be granted, argument to be heard on Feb. 21. Mr. Averill was appointed receiver of the road by the South Carolina State Court on Jan. 27. The Attorney General of the State has already instituted suit to forfeit the charter of the road, and it is understood this suit will be pressed to a verdict in the event of Comer still continuing to manage its affairs.

Wheeling & Lake Erie.—Poor & Greenough, of 20 Wall street, New York, offer for subscription $600,000 of the consolidated mortgage, four per cent. 100 year bonds of this company at 75 per cent., the bonds being the entire amount outstanding under the consolidated mortgage. A further amount of these bonds not exceeding $1,000,000 may be issued in the future for the acquisition of property, and the balance of the bonds, $6,400,000, are reserved for the redemption of the existing divisional mortgages.

TRAFFIC.

Traffic Notes.

The East Tennessee, Virginia & Georgia now limits all its local tickets to one day after the date of sale.

The railroads centering in Washington have agreed to carry passengers to that city at half rates on the occasion of the Presidential inauguration, March 4.

A company has been formed to buy up and consolidate all the baggage transfer companies in the cities on the line of the New York Central. The President of the consolidated company is James W. Tillinghast.

The New York Central has made a uniform passenger rate of five cents from and to all stations on the Buffalo Belt Line, tickets to be good, however, only on the Belt Line trains. They must be purchased in packages of five or more. The announcement of the company states that the cost of running these trains is $100,000 a year, so that two million passengers will be required to make this rate pay expenses, while the number of passengers carried during the last fiscal year was only 869,000.

The Commissioner of Immigration at New York City has notified the Inspectors at Ellis Island to give all immigrants from Europe a chance to buy their railroad tickets to the West wherever they please, instead of sending them to the joint ticket office of the railroads, (at Ellis Island), as has been hitherto done. The effect of this is to throw a good share of the business into the hands of ticket brokers on the streets of New York. The issuance of this order seems to have been due to the fact that brokers have been selling a great many tickets at a large discount from regular rates.

The lately expired contract between the Trans-continental railroads and the Pacific Mail Steamship Company, under which the railroads paid a subsidy to the steamers in order to maintain freight rates between New York and San Francisco has been published, the publication having been brought about apparently by the interests which are now engaged in a quarrel with the Pacific Mail. Some of the newspapers make much of the fact that this contract was a violation of the contract made between the Pacific Mail and the government for carrying the mails; but the terms of the railroad contract, as published, are no different from what they have been openly stated as being for many months past. The amount guaranteed to the steamers was $75,000 a month.

The coal carrying railroads of Ohio held further meetings in New York last week to try to agree upon rates from the mines to Lake Erie, but nothing definite is given out concerning the results. The New York *Times* reports as follows:

"The six railroad companies which handle the coal produced in the Ohio bituminous fields have resolved to continue their association and preserve a uniform schedule of rates. The resignations of the Columbus, Hocking Valley & Toledo and the Columbus, Shawnee & Hocking were withdrawn and an agreement was entered into limiting the production and output of coal and establishing a fixed scale of rates. A committee was appointed whose duty it shall be to meet once a month and publicly arraign any company found guilty of violating the agreement. The contract between the railroad companies implies responsibility for the behavior of the producers."

Chicago Traffic Matters.

CHICAGO, Feb. 1, 1893.

The Ohio River lines have at last decided that it is time to stop the senseless cutting of rates and have agreed to a restoration of the $7 basis, which means an advance of $3.50. No date has been formally fixed as yet, but it is understood that rates will be checked up as rapidly as possible. They have also voted to place all facts relating to the existing differences before a board of arbitration consisting of Messrs. Walker, Blanchard and Donald on or before Feb. 15, with the stipulation that after a study of the situation as thus presented this board shall prescribe rates and rules to govern in this territory, to which all the lines pledge themselves to abide for 10 months.

The Western lines would like to carry into effect the agreement just made, to stick to a commission of not more than $2.50 per passenger on immigrant tickets, and reinstate the Northwestern division of traffic. The majority of the lines favor this, but the Wisconsin Central objects to the percentage of the competitive business which the other lines think it is entitled to, and unless it can be satisfied in this respect the agreement is not likely to be maintained.

Passenger rates west of Chicago on transcontinental business are badly demoralized and there is a general "go-as-you-please" policy pursued in regard to the payment of commissions. A prominent official said to me the other day that matters were growing worse every day, and that unless the roads came to their senses soon and entered into an agreement in regard to the payment of commissions, *and kept it*, there could be no stable rates fixed for the World's Fair traffic and all the roads would be in a scramble for the business, with a result that none of them would make any money.

The Eastern lines are doing fairly well since they entered into their new agreement, and the most of them are evidently sincere in their promises to maintain rates. In fact, at present they are on a much firmer footing than the Western lines in this respect.

Chairman Caldwell rules that eastbound traffic originating at Omaha and not destined to any other Missouri River gateway is subject to the Western Passenger Association agreement.

There is no doubt that the most of the Central Traffic and Trunk Line Association lines are carrying into effect without question the orders of Messrs. Walker, Blanchard and Goddard. It is too soon for results to be manifest, but the indications are that the plan for controlling eastbound tonnage will prove a success.

Chairman Midgley's plan for controlling traffic in Western Freight Train Missouri Association territory is apparently shelved, as nothing has been heard of it for some time As was fully stated at its inception, the lines controlling their own rails east and west of the Missouri River would not consent to any agreement which compelled them to "even up" by giving up a portion of their traffic to lines having no rails beyond the river.

The shipments of eastbound freight, not including livestock, from Chicago, by all the lines for the week ending Jan. 28, amounted to 80,042 tons, against 66,407 tons during the preceding week, an increase of 13,635 tons, and against 96,812 tons during the corresponding week of 1892. The proportions carried by each road were:

Roads.	W'k to Jan. 30.		W'k to Jan. 21.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	11,229	14.	10,553	16.
Wabash	5,900	7.4	4,450	6.7
Lake Shore & Michigan South.	13,323	16.7	10,988	16.6
Pitts., Ft. Wayne & Chicago.	10,439	13.	8,457	12.7
Pitts., Cin., Chicago & St. Louis	8,915	11.1	8,274	12.5
Baltimore & Ohio	4,686	5.9	3,051	4.5
Chicago & Grand Trunk	8,482	10.6	9,032	13.6
New York, Chic. & St. Louis	5,684	7.1	4,697	7.
Chicago & Erie	8,908	11.1	4,115	6.3
C., C., C. & St. Louis	2,476	3.1	2,790	4.1
Totals	80,042	100.0	66,407	100.0

Of the above shipments 7,450 tons were flour, 36,103 tons grain and millstuff, 10,366 tons cured meats, 14,061 tons dressed beef, 2,433 tons hides, and 3,718 tons lumber. The three Vanderbilt lines carried 37.8 per cent., the two Pennsylvania lines 24.1 per cent.

Grain Exports from Philadelphia.

The annual report of the Philadelphia Commercial Exchange shows a remarkable increase of the commerce of the city during the year 1892, which is ascribed by the report to the "very generally fair treatment accorded by the inland transportation companies toward the trade of the city." It might fairly be added that the new connections and increased business of the Reading road have been large factors in the increase of business, and that the development is likely to be continued. The receipts of wheat increased from 6,823,166 bushels in 1891 to 12,020,805 bushels in 1892, and of corn from 5,622,000 bushels in 1891 to 22,271,406 in 1892. The increase of exports compared with the increase at other ports is no less gratifying. The exports of wheat from Philadelphia increased 44 per cent.; from New York, 7 per cent.; from Baltimore, 3 per cent. The exports of corn from Philadelphia increased 604 per cent.; from New York, 42 per cent.; from Baltimore, 306 per cent.—*Philadelphia Public Ledger.*

Anthracite Coal Shipments for 1892.

The amount of anthracite coal shipped during 1892 was briefly reported in the *Railroad Gazette*, Jan. 13. More detailed statements have now been made public. The figures show that the total increase for 1892 over 1891 was 1,444,983 tons. The Reading group, made up of the Reading, Lehigh Valley and Jersey Central, show a decrease of 1,122,483 tons.

	1892.	1891.	Inc. or Dec.
Reading and Lehigh Valley	15,135,581	15,821,549	D. 685,968
Jersey Central of N. J.	5,271,131	5,857,968	D. 586,837
Lackawanna	6,529,649	6,198,048	I. 331,601
D. & H. C. Co.	4,058,526	3,939,917	I. 118,609
Pennsylvania	5,571,320	4,994,509	I. 576,811
Penn. Coal Co.	1,921,929	1,692,419	I. 228,610
N. Y., L. E. & W.	1,388,822	1,204,271	I. 184,551
N. Y., Ontario & W.	807,071	695,770	I. 111,301
Coxe Bros. & Co.	1,210,187	43,882	I. 1,166,305
Total	41,893,316	40,448,333	I. 1,444,983

It was stated this week by an officer of the Reading that owing to the scarcity of cars not more than two-thirds of the New York orders for coal have been filled. The company, he said, had plenty of coal above ground, but it would require at least a week of mild weather to enable the company to supply orders ten days old.